

WIRED

February 1996

How I Caught
Supercracker
Kevin Mitnick

Smart Cars

The Fall of the EFF

Annou plog!

Steve Jobs The Next Insanely Great Thing!

The Wired Interview
by Gary Wolf



0 74820 08887 6

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**It happens to the best of us.
Just as we start getting ahead in the world,
we begin to get cut off from it.**

**The Volkswagen Passat GLX is designed
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something again.**

**The Passat GLX is a true German sports
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The track-correcting rear axle, rack and pinion steering and independent suspension provide excellent road manners. Traction control helps prevent wheel slippage that may occur while accelerating on slick surfaces.

A thoughtful interior adds to the driving experience without feeling cluttered or fussy.

Everything about driving one feels different. You feel the road, the car and how you're connected to it all.

The German engineered front-wheel drive Passat GLX starts at \$21,890.

It's technology that invigorates you.

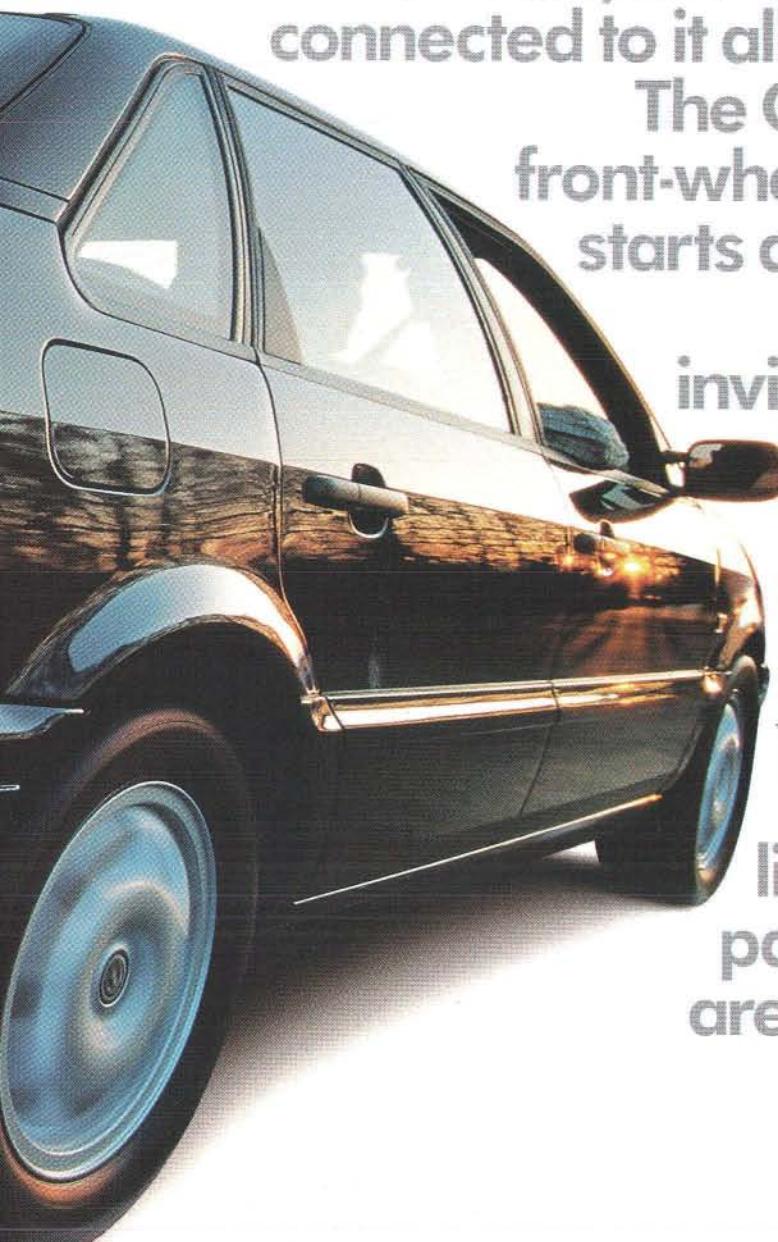
Never isolates you.

That's what we're about.

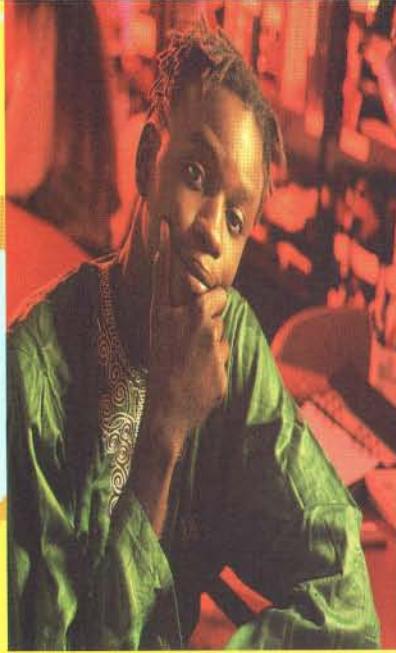
Is that what you're about?

On the road of life there are passengers and there are drivers.

Drivers wanted. 



Maybe he's thinking how to bring the Internet to his country.

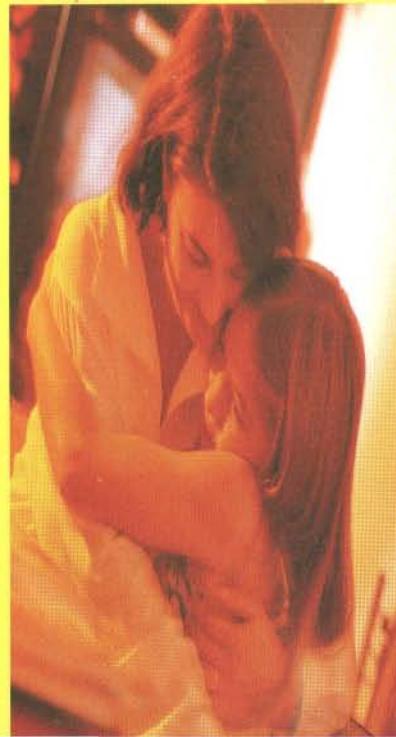


We suggest a suitcase.

The VOL Case
A package deal of technologies and services to become a local online in a worldwide network.

A local online all

Her heart speaks the language of her mother, and that of her mother's mother, and that of her mother's mother's mother.



Shouldn't her browser speak the same language too?

VOL Browser
is an Internet browser that speaks 35 different languages, covering Africa, America, Asia, Australia and Europe.

Video On Line

is an online service which is integrated into the Internet.
It is the first to develop all the multicultural and multilingual potential of the network, creating a local online all over the world.

VOL Browser is the first step in the realisation of the "local online all over the world" project. It is an Internet Web browser which is completely free; it can handle 35 languages from all continents, incorporates **Java (tm)***, and **Real Audio (tm)***: clear digital sound in real time, without download delays.

To develop its own project in every country in the world, Video On Line offers partners **the VOL Case**: a package of technology which includes know-how, software, commercial

advantages, training and support to make any partner capable of constructing a local Video On Line in their own country in the space of a few months.

Every local Video On Line can become, if it wants, an Internet provider; but above all, every local Video On Line will become a part of VOL Mirroring and VOL Search: two global information search and duplication systems which represent two cornerstones in the development of the project.

VOL Search is the first search

system capable of carrying out searches on servers distributed around the world. Constructed on the basis of Fulcrum technology and on software specifically developed by Video On Line, it permits the user to make a search by selecting sites on the basis of geographical location, language, and a predefined quality standard. VOL Search will include shortly the **Intelligent Agent**.

VOL Mirroring is a system designed to anticipate possible network problems. It entails the

over the world.

duplication of home pages on the server closest to the geographical place from which the home page will be consulted most often. Let's imagine for example a home page which receives 50% of its visits from America and 50% from Europe. Duplicating the information on

servers in both the United States and in Europe guarantees American and European users alike much easier and faster connection.

Among other features, the VOL Case includes the **VOL Web Space** software, which permits users anywhere in the world to

automatically upload and maintain their own World Wide Web content. Thanks to VOL Mirroring, this content can be automatically placed on the server closest to where the user is situated, or on any of VOL's servers around the world.



Navigate with us in cyberspace:

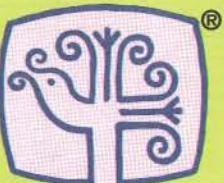


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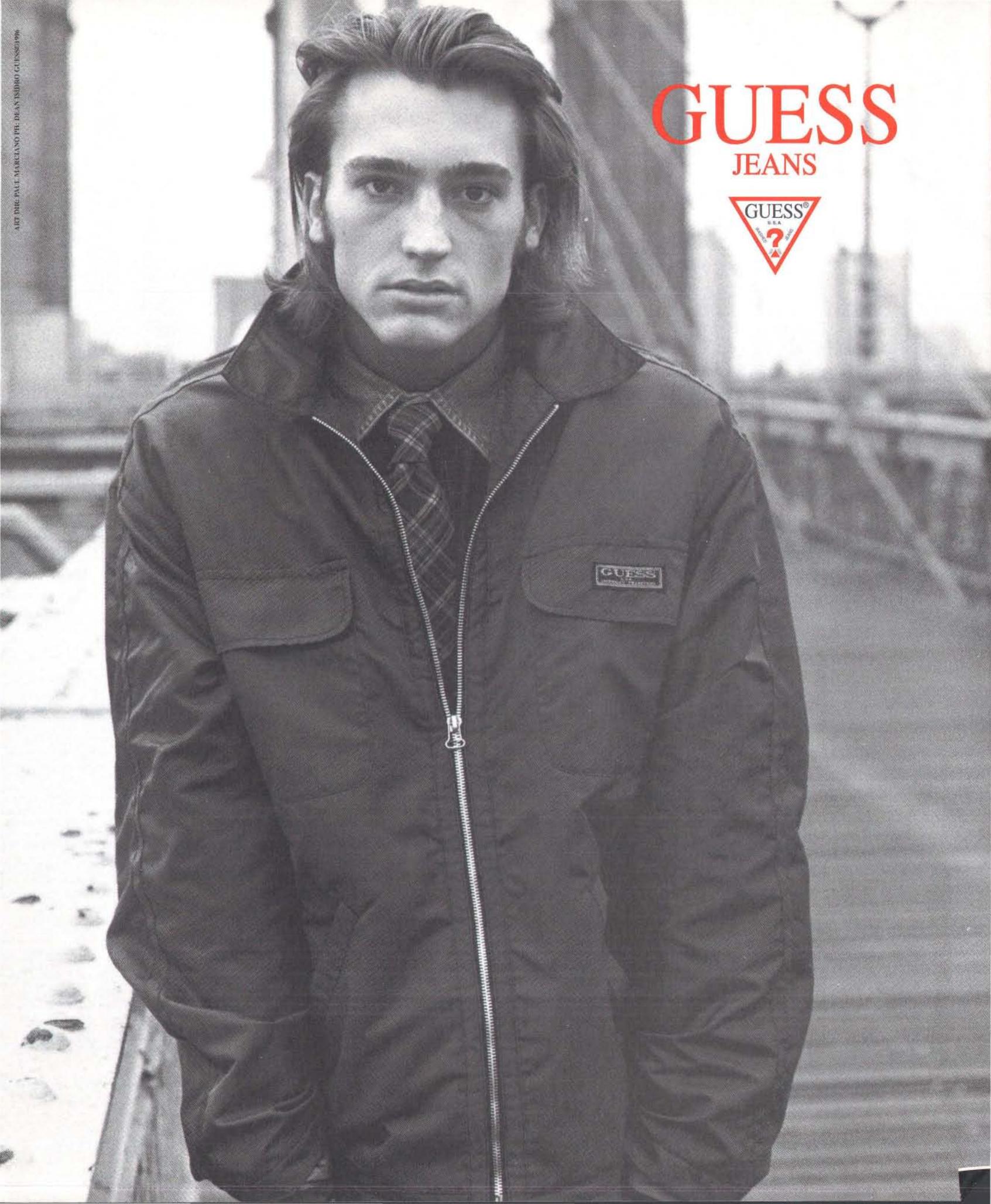
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VideoOnLine

[WWW:<http://www.vol.it>](http://www.vol.it)
email: volcase@vol.it





A black and white photograph of a young man with long hair tied back, looking directly at the camera with a serious expression. He is wearing a dark, zip-up jacket over a plaid shirt. A small rectangular patch with the word "GUESS" is visible on the left chest of the jacket. The background is a blurred outdoor setting, possibly a beach or industrial area.

GUESS JEANS



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colorful
ideas are

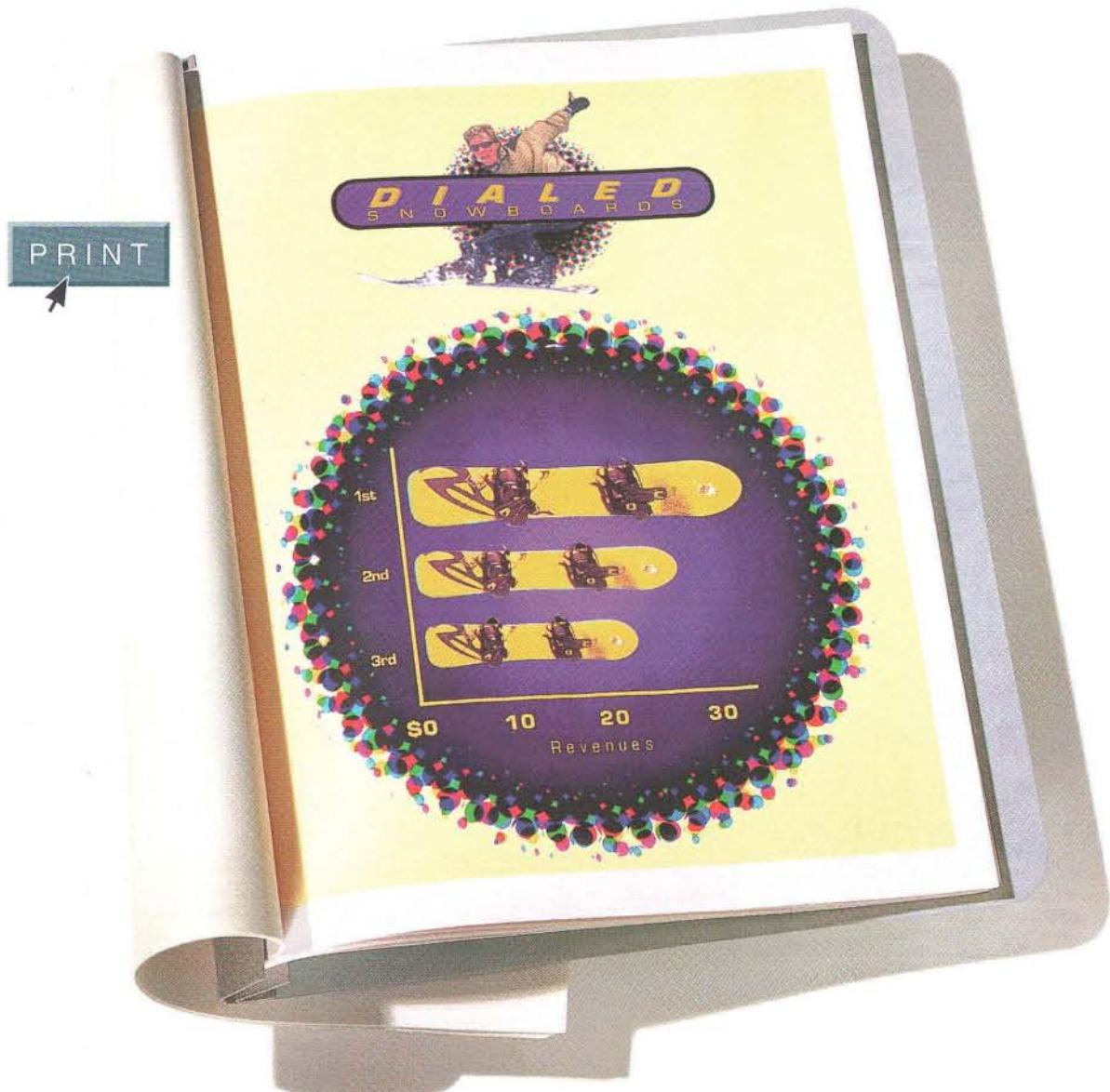
loaded in a hard drive.

Here's

the

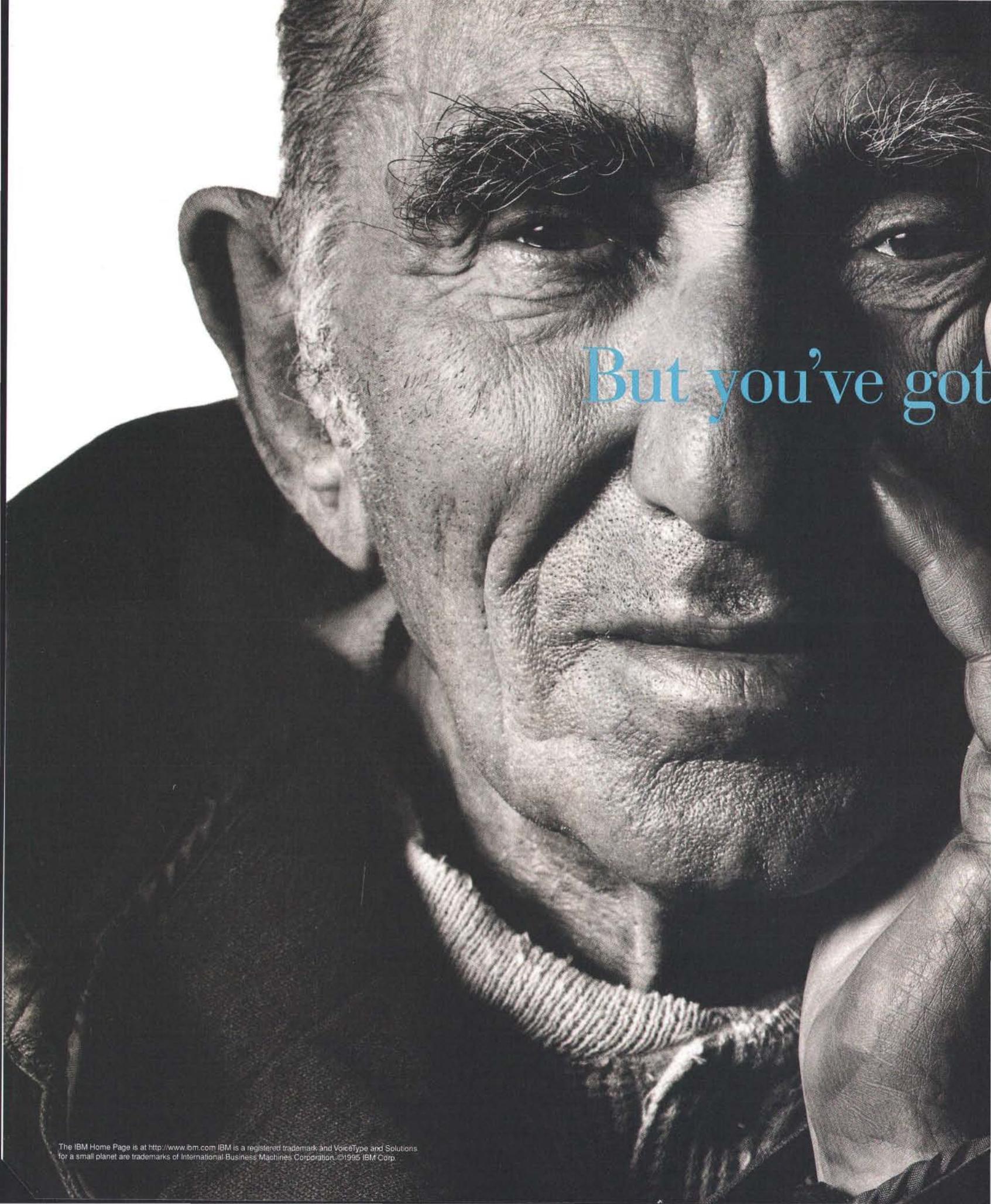
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 EPSON COLOR INK JET PRINTERS. First it was just an idea in your mind's eye. Then you fleshed it out on your monitor, breathed life into it with color. Now the only thing between your idea and proof of its brilliance is your printer. Better make sure it's an EPSON. 720 x 720 dpi of Photo Quality, ink jet color for as little as \$449. Color so beautiful even Mother Nature will be jealous. We call it Epson Color. To see it, call 1-800-BUY-EPSON x3100 or visit our web site. And free your ideas from the tyranny of black and white.

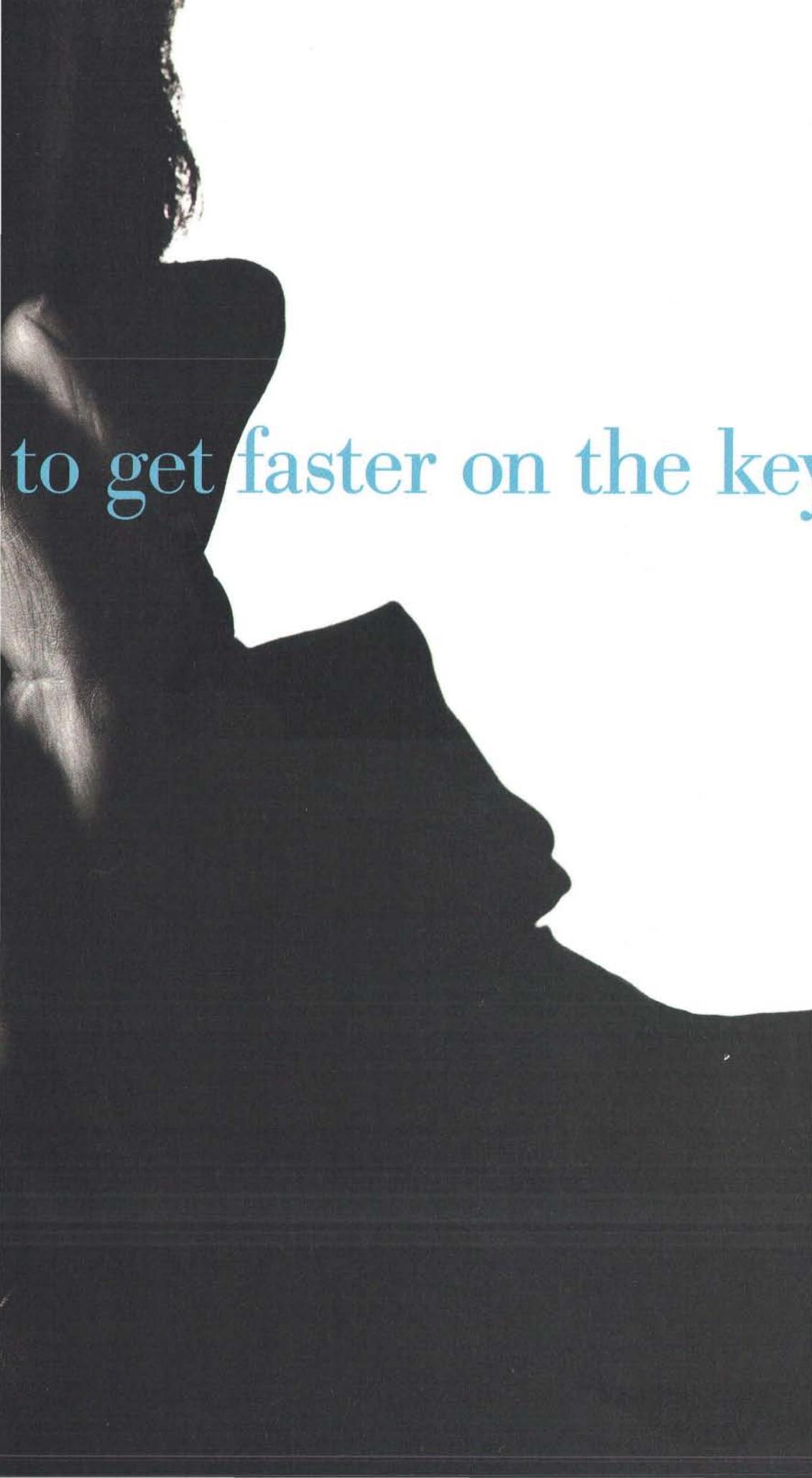


The line of Epson printers starts for as little as \$449. NOTE: Manufacturer cannot be held responsible for incidents of shock, awe, or over-stimulation resulting from exposure to 720 x 720 dpi of concentrated, Photo Quality, slap-in-the-brain Epson Color.

YOU'VE GOT TO SEE IT IN **EPSON** COLOR.TM



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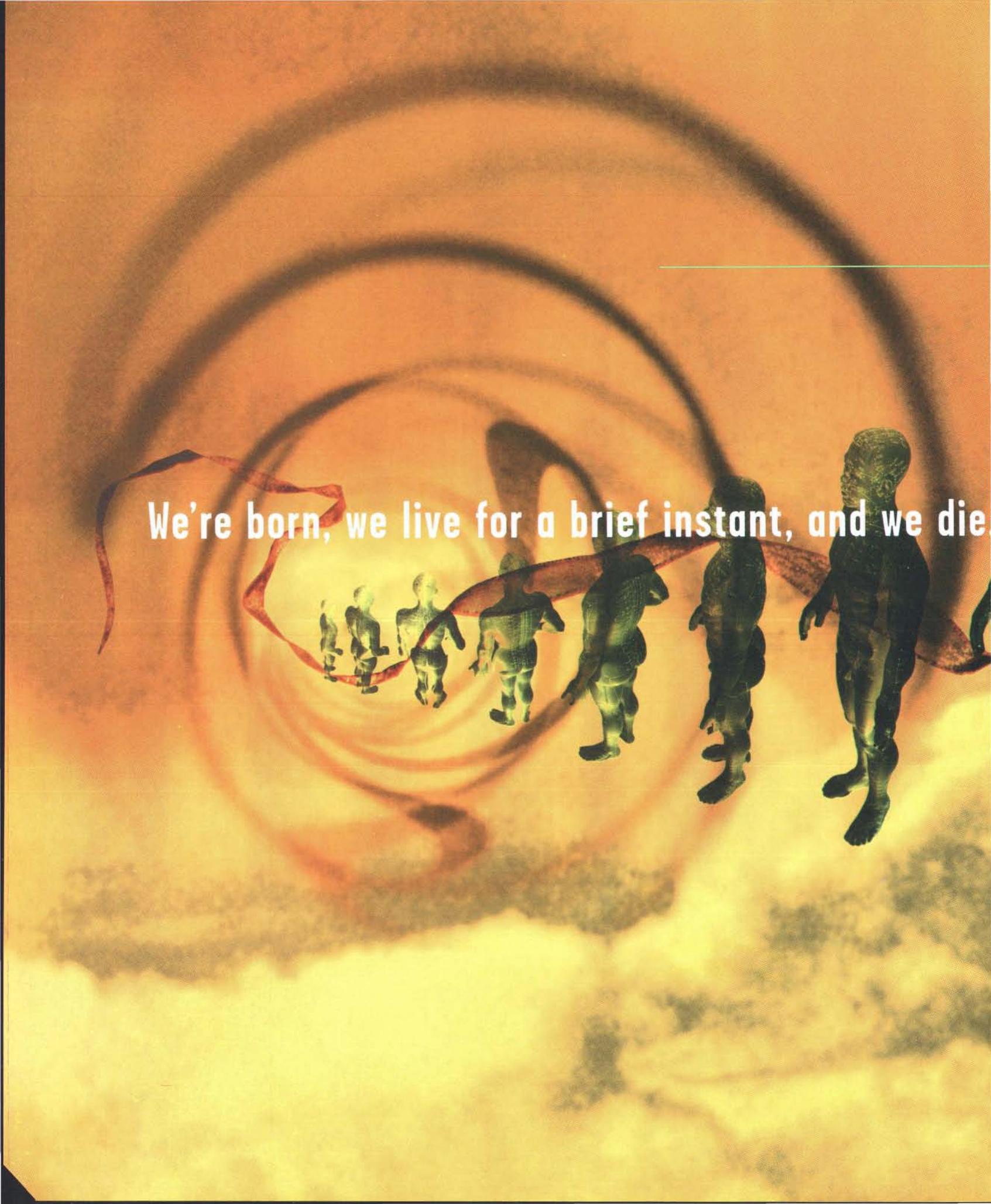
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Technology is

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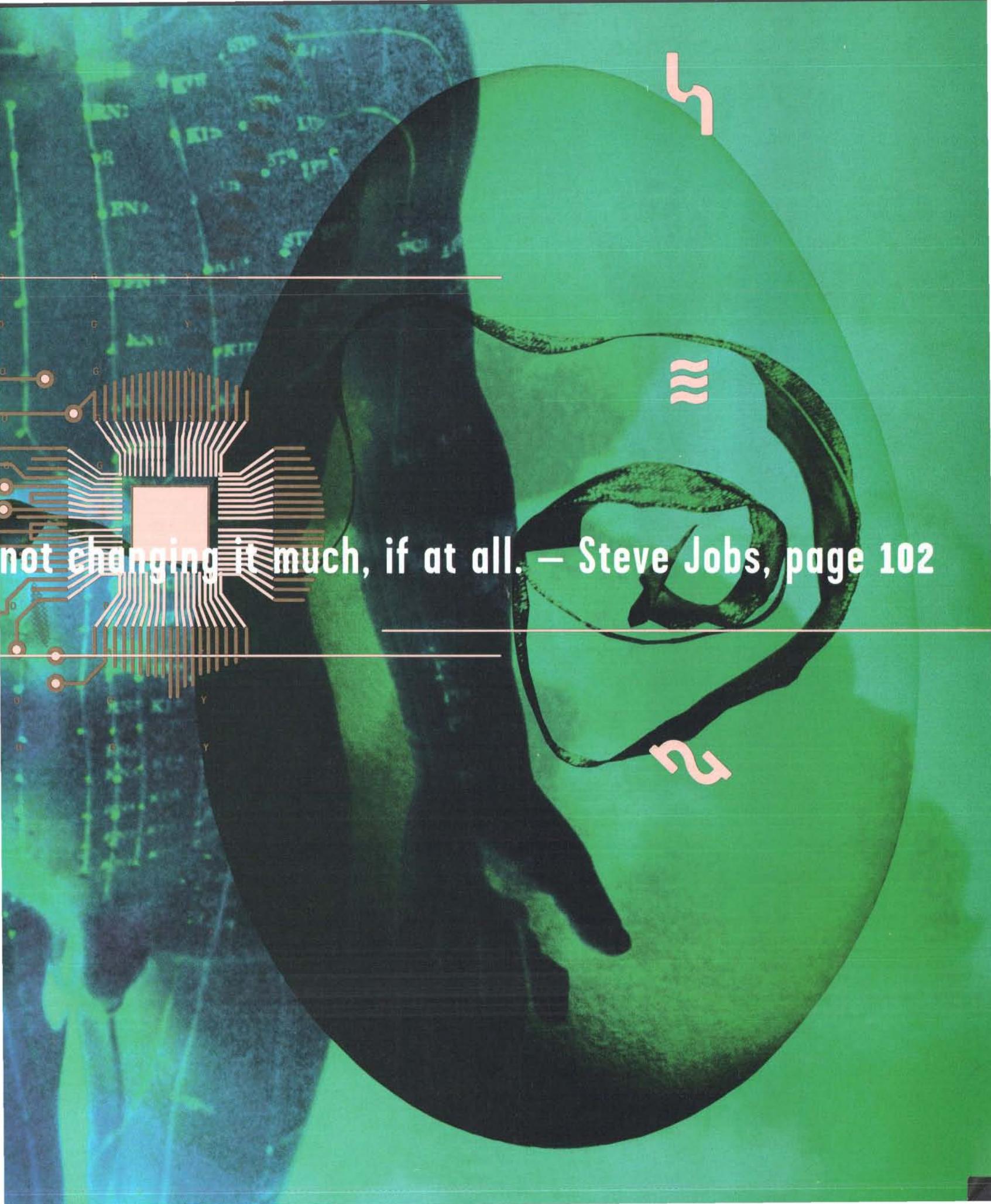
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not changing it much, if at all. — Steve Jobs, page 102

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Cover: Steve Jobs photographed by Steve Double, October 1995, Redwood City, California.

Introduction: Giles Dunn.

Haitian-Kreyol translation courtesy of Direct Language Communications Inc.



W | R | E | D

4.02

February

1996



Steve Jobs

The next insanely great thing. The Wired Interview by Gary Wolf.

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Way New Leftists

Arthur and Marilouise Kroker believe the new "virtual class" is exploiting the neoproletariat "surplus flesh." By Jean-Hugues Roy



Bangalore

It's been called the Silicon Valley of India. But does it really have the entrepreneurialism and creativity of its namesake, or is it destined to remain the low-cost supplier to American and European IT giants? By Richard Rapaport



The Color of Money

There's poetry in Dutch money – and you should take that literally. By Rogier van Bakel



Catching Kevin

Legendary cracker Kevin Mitnick had violated one computer too many – hacker Tsutomu Shimomura's. The exclusive story of the last hours of Shimomura's quest for justice, as he closes the trap on his prey. By Tsutomu Shimomura with John Markoff



Privacy Is History – Get Over It

The issue isn't privacy, according to science fiction writer David Brin, it's equality of exposure. By Sheldon Teitelbaum



The Information Superhighway (This is not a metaphor.)

Smart cars running on smart highways are but six years from prototype. By Joe Wiesenfelder



David Carson: The End of Print

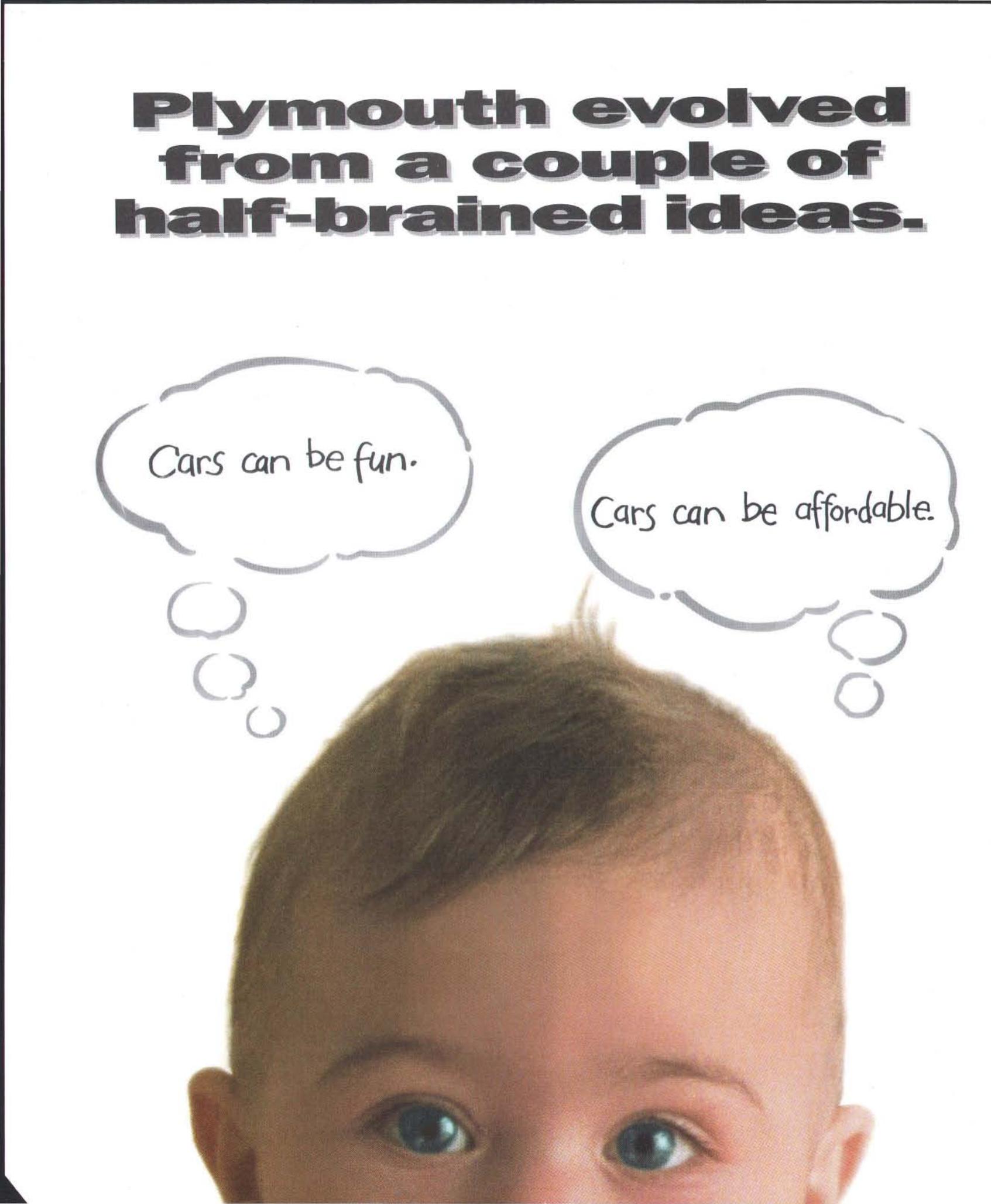
Graphic design that communicates on a level beyond words. By Thomas Schneider



How Good People Helped Make a Bad Law

The Electronic Frontier Foundation went to Washington to "hack politics down to its component parts." Then it helped pass the FBI's loathsome Digital Telephony Bill. And discovered it was Washington that had reverse-engineered the EFF, driving it into dissension, debt, disgrace – and right out of town. By Rogier van Bakel

Plymouth evolved from a couple of half-brained ideas.

A close-up photograph of a baby's face, looking directly at the camera with wide, curious eyes. Two thought bubbles float above the baby's head, containing text. The baby has dark brown hair and is wearing a light-colored onesie.

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There's a little voice that says, "Buy the fun car." Then there's the one that says, "Buy the car you can afford."  It can be very hard to choose. We say, lend 'em both an ear. Buy a Plymouth. You'll find fun, clever ideas in every Plymouth—Neon, Voyager, Grand Voyager and the new Breeze. Ideas like cab-forward design, which gives all of them a wider stance and provides more interior room to stretch out  and enjoy the exceptional handling. You'll also find every Plymouth offers convenience—from the available driver's side sliding door and standard Easy Out Roller Seats™ in the new Voyager and Grand Voyager to Neon's available split-folding rear seat and to Breeze's rear seat air vents. And while you're having your fun,

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Plymouth Breeze nicely equipped at \$14,595.*



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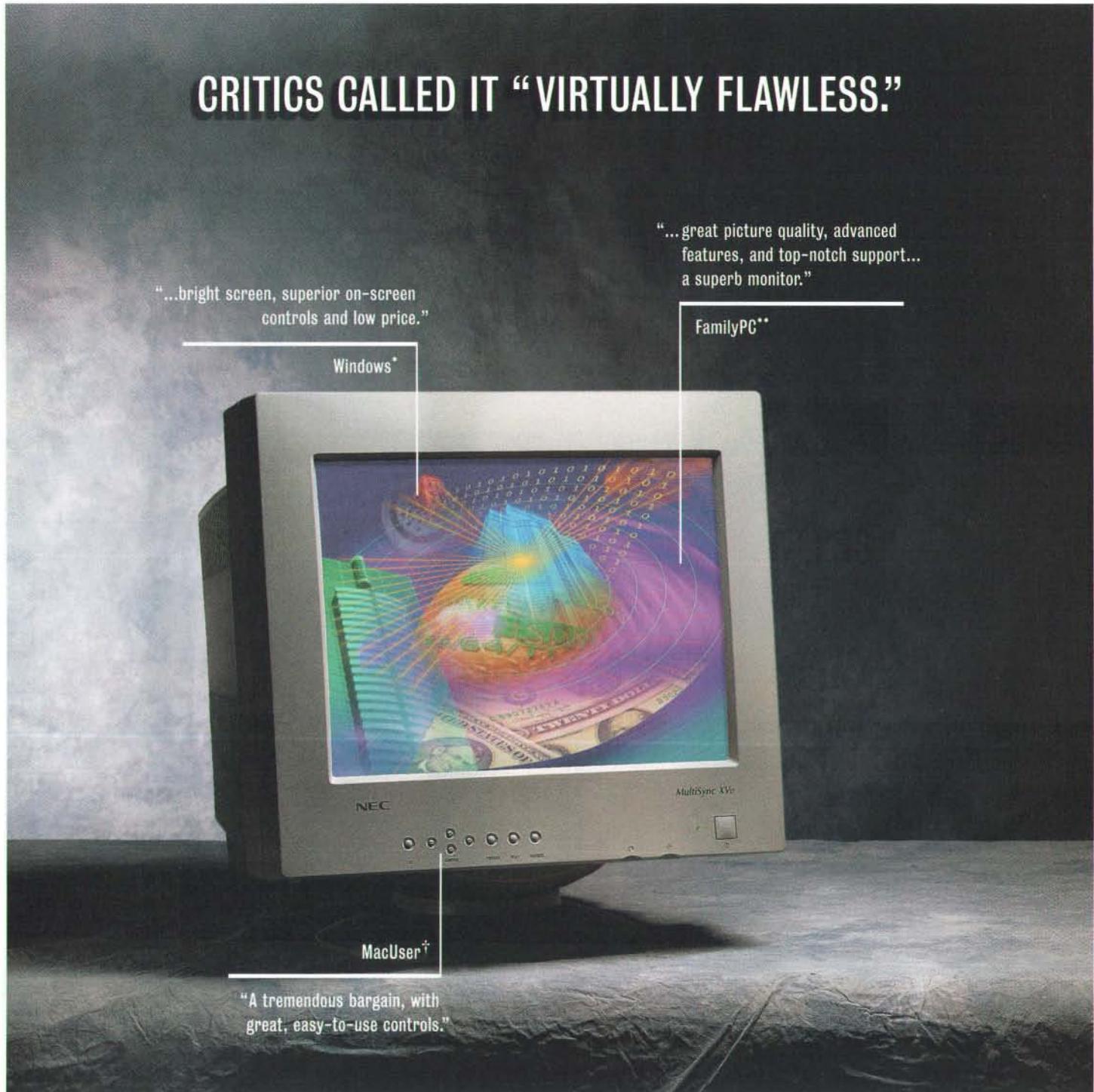
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Windows 95

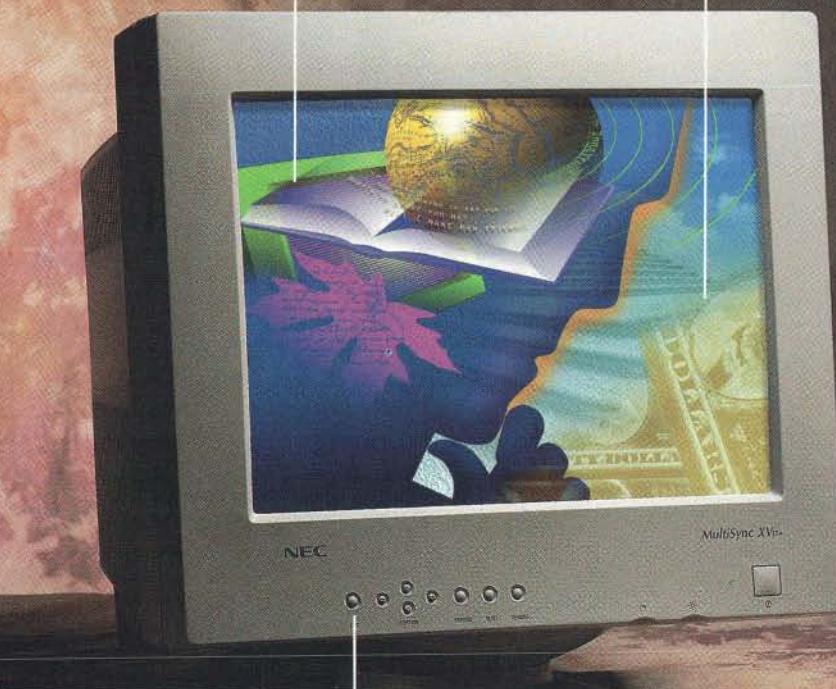
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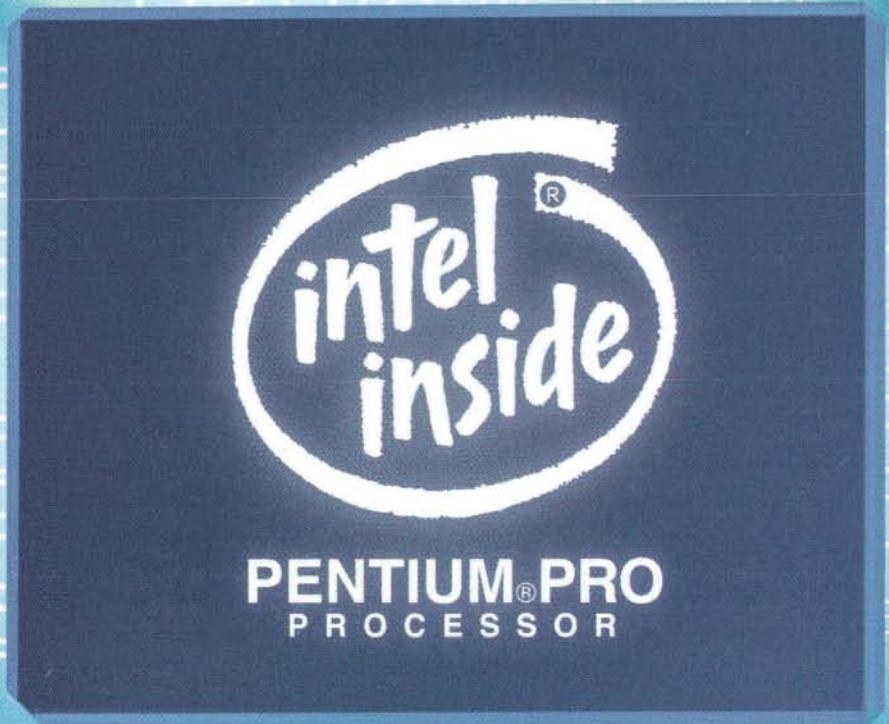
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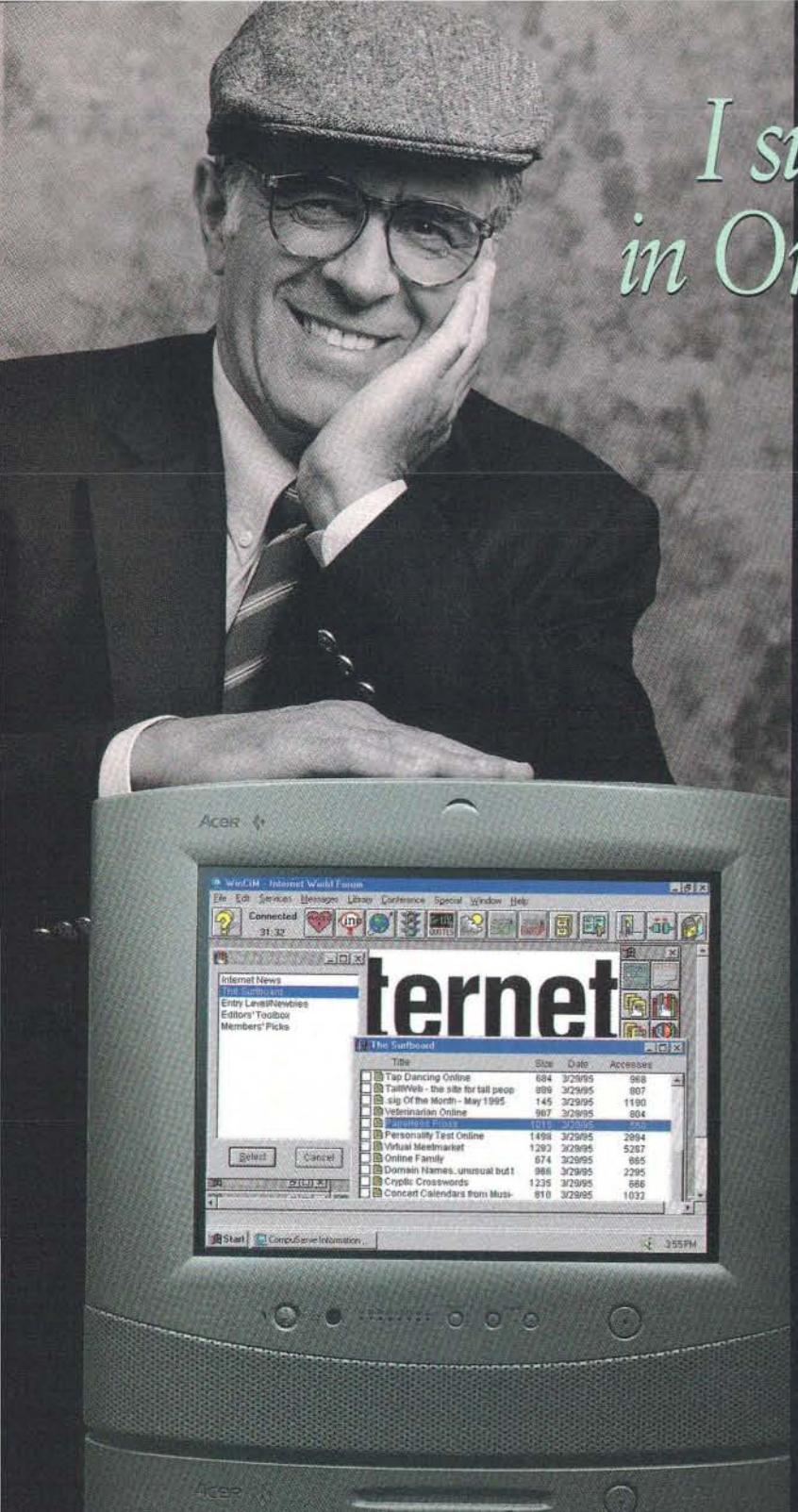
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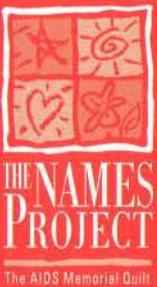
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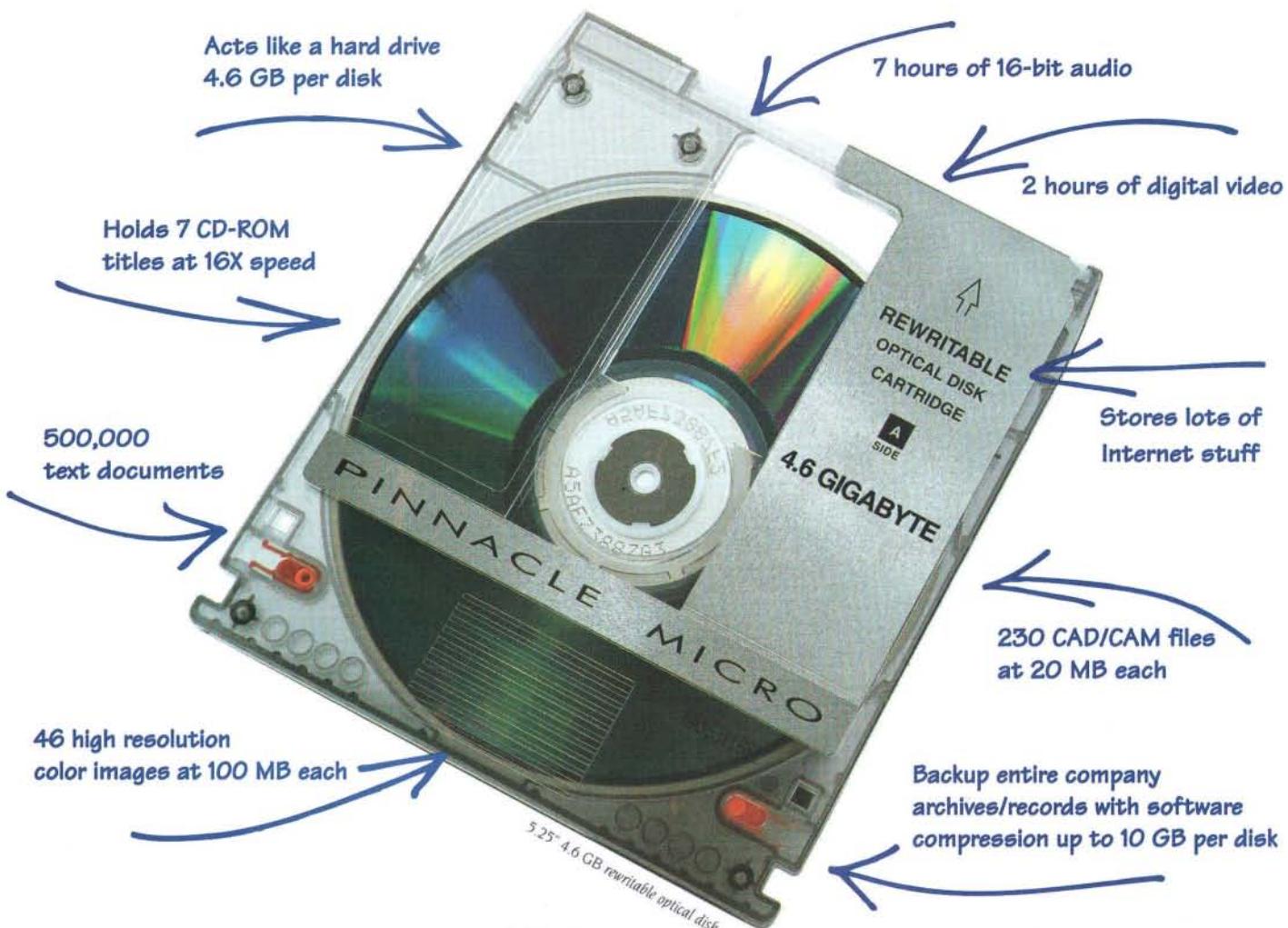
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Advertising sales advertising@wired.com

General questions info@wired.com

E-mail server info-rama@wired.com

Rants & Raves
Rant

The most efficient way to reach us at *Wired* is via e-mail. Some addresses, such as guidelines@wired.com or info-rama@wired.com, will bounce back text, freeing us human types to create the next amazing issue of *Wired*.

That's All, Folks!

Netscape's Bugs Bounty program, which you mocked (*Electric Word*, *Wired* 3.12, page 48), strongly appeals to what Steven Levy called the Hacker Ethic. Most of the people with the technical expertise to find security holes in Netscape's Navigator 2.0 browser would do it just to see if they could. They have neither the time nor the inclination to illegally exploit the holes they discover. By offering a reward, Netscape provides an incentive for these people to spend their spare cycles looking for Navigator bugs instead of some other technical challenge. The company is betting that the holes found by this type of hacker will include and outnumber the holes found by hackers who would exploit them. Netscape understands the Hacker Ethic. I'm not surprised that you don't.

Lester Ward
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Location Lives

"To change the way people interact with the geometry of the world," says Russell Shields when asked what excites him about his company's new geographic information systems technology ("Ground Truth," *Wired* 3.12, page 96). By doing what?

"I have no idea where I am at any instant, and I don't really care," author Tim Barkow writes later in the piece. This is not a new way of interacting with or thinking about geography. Rather, this is not thinking about the world around one at all!

A map – digital or paper – is a tool, a representation of the world in which we live. Adding global positioning system technology to a map makes it a much more powerful tool – a navigation system.

This system allows drivers to follow its directions blindly. Drivers do not have to think at all about where they are or where they are going. With an accurate enough system, they will never get lost, but they also will never learn how to find their way. They

don't have to learn how addresses are arranged on a street or how streets are arranged in a city. In short, they don't have to know anything.

For the average driver, commuting to and from work along the same path day in and day out, this system would be nothing more than another complicated gadget cluttering the dashboard.

Now don't get me wrong – this system would be useful to a traveler who had never been to a city before, will leave the next day, and has no interest in the area. Being able to call up custom directions at the touch of a button would be invaluable. But for those who have just moved into town, relying on the

ground for computers in the movie business? *The Last Starfighter* used a Cray supercomputer to generate most, if not all, of its space scenes, including the combat sequences. I believe this was a first at the time. In addition, how could you discuss Disney and not mention *Tron*, its problematic, first major effort in using computers to make a movie? Whatever you might say about the story, the people behind that film pushed the technology of the time – further than it could go, perhaps. Considering how *Tron* fared with the critics and at the box office, it wouldn't be surprising if Disney failed to mention it.

On the small screen, the syndicated *Babylon 5* has been advancing the art of computer-generated special effects ever since the show first aired three seasons ago. The effects have become ever more polished, including the creation of completely synthetic actors, albeit alien ones.

Finally, I'm surprised that one particular television effort remains a big secret with publications of your genre – *ReBoot*. While John Lasseter has been toiling for four years to bring his epic to the

big screen, the people behind *ReBoot* have already produced hours of computer animation. Get up early some Saturday morning and give it a look.

Larry Roth
rothl@wadsworth.org

alt.copyright.war

I read with interest your piece on the Church of Scientology ("alt.scientology.war," *Wired* 3.12, page 172). Frankly, the church should be applauded for its efforts to protect its intellectual property on the Net. Face it, if these works were yours or mine, we'd do the same.

The bottom line is that copyrighted material is copyrighted material. Anyone who messes with it



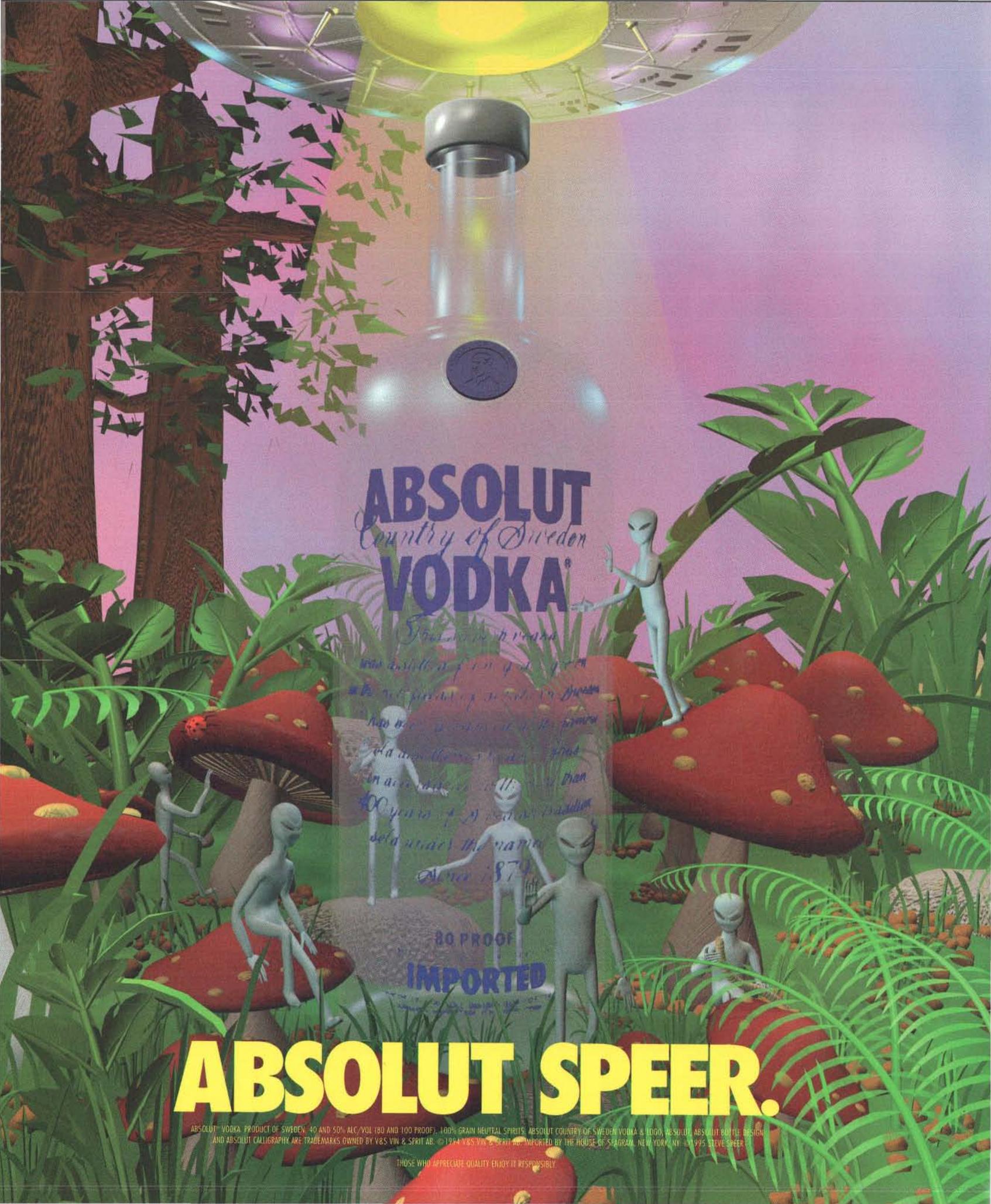
system to tell them how to get to the store, to work, to the gas station, and back home eliminates the need to learn where anything is located.

"Location is dead," the article claims. How can an object not be in a place? Location is not dead – although understanding how to find a location will die with this system.

William Anderson
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Silicon Quibbles

"The New Hollywood: Silicon Stars" and "The Toy Story Story" were fascinating (*Wired* 3.12, pages 142 and 146), but I have some minor quibbles. How could you have overlooked two films that broke new



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should be dealt with to the fullest extent of the law. The Net is no exception.

Derek De Vette
ddevette@executive.com

The Emperor's New Network?

I just returned from Telecon XV, a videoconferencing trade show, where I had great fun with "RIP ISDN?" (*Wired* 3.11, page 50). I took the article to the AT&T booth. A few people had heard of AT&T Paradyne; none had heard of GlobeSpan and its touted 6 Mbps over standard twisted pair. At the IBM booth, experts said it may be a lab phenomenon but can't be true in the real world. At several ISDN seminars, the piece caused a reaction similar to the first showing of the emperor's new clothes.

My reaction: if 6 Mbps or even 3 Mbps can be bought for less than US\$50 per month, there will be an explosion of new telecommuting, videoconferencing, desktop conferencing, home monitoring, and entertainment devices. The hard work of designing the equipment is done; all that's lacking is cheap bandwidth.

Ned Van Hamm
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Blacked Out

"Exposing the Black Budget" (*Wired* 3.11, page 94) missed the major point in assessing the CIA. The article repeatedly attributes government misinformation to incompetence, when in reality one of the main goals of the black budget and the intelligence community is to mislead people – including the people of the US. For example, the article states, "Now that we know the CIA grossly overestimated the economic resolve of the Soviet Union...." In fact, the intelligence gathered by the CIA on the economic and military strength of the USSR was very accurate. Both the agency and the government knew that the "missile gap" and other stories of alleged Soviet strength were lies. See Chomsky's books *Manufacturing Consent: Noam Chomsky and the Media* and *Necessary Illusions: Thought Control in Democratic Societies* for detailed documentation of these facts.

Michael DeBellis
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Some Hivestory

Steve G. Steinberg's article "Hive Computing" (*Wired* 3.11, page 80) offered a good summary of the issues involved in making distributed computing a mainstream reality, but the article was also extremely misleading.

Steinberg writes that the concept of hive computing "has been discussed for years, but until now has never been practical." This is a blatant distortion of the truth. While the specific hive computing technologies created by researchers at Princeton Uni-

versity and the University of California at Berkeley may be new, distributed computing has been around for years and has been used with great success in numerous commercial applications.

One of the best examples is Hewlett-Packard's Task Broker software, which has been used to create distributed network processing solutions in environments ranging from engineering labs to Wall Street. Another excellent example that has been around almost as long is Raydream Designer's distributed rendering solution for the Mac.

Aubrey McAuley
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What makes the hive computing schemes I described unique is that they can speed up any application (by using network RAM and distributed disk storage), not just special distributed applications.

– Steve G. Steinberg

Intel's Insides

I wish you would edit out such truly sophomoric comments as the suggestion that a German programmer's theft of Intel Pentium trade secrets is "another case of the Internet breaking through censorship" ("Inside Intel," *Wired* 3.11, page 55). Intel has every right to keep confidential any information that gives it a competitive edge; labeling that "censorship" is ludicrous. And *Wired*'s decision to lionize, rather than deplore, the programmer who publicized the data is disturbing. *Wired* should be condemning the new generation of digital bandits, not casting them as freedom fighters.

Christopher J. Palermo
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On Your Mark, Get Set, Write!

Your article on Dan Hurley ("Fast Fiction," *Wired* 3.11, page 90), America Online's first 60-second novelist, brings to mind Balzac, who, when asked how he managed to write 90 novels in 30 years, retorted, "I never use labor-saving devices."

Neil Stewart
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An Amazing Guy

Douglas Hofstadter is an amazing guy. According to Kevin Kelly ("By Analogy," *Wired* 3.11, page 110), Hofstadter published the Pulitzer Prize-winning *Gödel, Escher, Bach: An Eternal Golden Braid* in 1979 and then spent "decades" working in the lab. All in only 16 years!

Ira Gessel
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Gödel, Escher, Bach was largely ignored by philosophers because Douglas Hofstadter committed one of the cardinal sins of the intellectual community: he

didn't do his homework – and apparently still hasn't.

The failure of many scientific types to advert to patterns in reality – Plato called them forms or essences – is due to their absolute unwillingness to consider metaphysical realities. It should be obvious to all but the blind that quantum events are organized in an extremely complex manner that we don't understand. The Greeks at least tried to deal with the issues; modern science focuses on the process ad nauseam and can't figure out why it hasn't gotten a clear answer yet. This is a little like trying to pull yourself up by your own hair. A point of reference other than observable data is required. Philosophical speculation under Aristotle gave the best answer yet for this – The Unmoved Mover. Without speculation on an outside force or consciousness operating on the quantum level, scientists such as Hofstadter are left just spinning their wheels.

Hofstadter should read *The Physics of Immortality: Modern Cosmology, God, and the Resurrection of the Dead* by Frank Tipler. Now there is a man who has done his homework.

Sean O'Reilly
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A Brilliant Venture

I laughed, I cried, it became a part of me ("The Relentless Pursuit of Connection," *Wired* 3.11, page 170). Damn good stuff, that article. I didn't think I'd get past the first paragraph of an article about venture capital, but it was brilliant. Pieces like this have kept me faithful to *Wired* ever since I saw a copy sitting next to a *Mondo 2000* my frosh year in college and flipped a quarter to see which one of the new cutting-edge technofuture magazines I'd buy. Thank god it was heads, or I'd be reading about the latest X craze at some rave on a farm in New Jersey.

Renfield Eric Feinstein
renfield@twicks.com

A Media Frenzy

In his article on the MIT Media Lab ("The Media Lab at 10," *Wired* 3.11, page 142), Fred Haggood writes: "As is often the case in nature, occupying a new niche requires radical mutations of the underlying phenotype." This trendy scientific name-dropping shows that the author doesn't know the difference between a phenotype and a photon. A phenotype is never underlying; it is by definition superficial (like this magazine?).

I'd love to read some creative, hard-hitting articles about cutting-edge ideas by people who really know what they are talking about, instead of technofluff that looks slick and pretends to be radical but has the depth and soul of an *Entertainment Tonight* for the CD-ROM set.

Chuck Paulson
paulson@lfc.edu

While Nicholas Negroponte is clearly a visionary of the nth degree ("Being Nicholas," *Wired* 3.11, page 146), his views on "being digital" appear to be a reflection of "being out of touch." To say that being digital is an egalitarian phenomenon is to ignore that the majority of the population is not wired because of the prohibitive cost of entry into the online world for most with a "small, lonely voice." While some people argue that anyone with a 286 and a 2400-baud modem can get connected, they ignore the reality that until a more accessible and affordable link to the Net is established, being digital for most people has more to do with Timex than Microsoft.

Dov Begun
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Please consider the following short article for your next issue.

"My boss is the greatest guy around. He's really wired! He's undertaken lots of projects, all of which have been tremendous successes. He wrote a book, which is really good. Here's how to buy it. He's proven all of his detractors wrong and will be judged by history as the savior of our time. In conclusion, my boss is just the greatest guy around."

This piece went over like gangbusters in my company newsletter, and I'm sure others would love to pay US\$4.95 to read it. I can write it myself, or I could pay an independent freelancer to write it to avoid the appearance of brown-nosing. Let me know.

David A. Blum
bulldog@primenet.com

New Zealous Deregulation

Ain't lead times a bitch? Bob Johnstone got the right story ("Godzone," *Wired* 3.11, page 164), but he missed the ending. On September 4, Telecom New Zealand blinked. Presumably fearful of both public opinion and government intervention, Telecom agreed to an interconnect deal with Clear Communications. A victory for the deregulated environment? Not quite. You'd be struggling to find any argument for the kind of telecom regulation that plagues most of the rest of the world — the benefits of the free market are that obvious. But what should have been a relatively straightforward interconnect deal has taken nearly five years to achieve, cost millions in legal fees, and has prompted government threats.

Telecom didn't, as Johnstone suggests, go to the Privy Council over Section 36 of New Zealand's Commerce Act, but rather touted the Baumol-Willig Rule, a bizarre principle aimed at protecting the incumbent in a natural monopoly. Under this rule, Telecom had the right to demand from any newcomer to the local-access market full compensation for every cent of business Telecom lost as a result of an interconnect agreement. It could have surrendered the entire local market to Clear Communications without any loss of

revenue! Staggeringly, the Privy Council upheld Baumol-Willig — and then suggested that if this proved a problem, the government could impose price controls. Yes, this economic illiteracy really did take place in a deregulated market.

In the meantime, Telecom's 30 percent return on equity is second in the global telecom industry only to Hong Kong Telecom — and is considerably more than what Bell Atlantic and Ameritech, Telecom's major shareholders, manage on their own turf.

A burst of infrastructure spending immediately before and after the state monopoly was privatized gave us a top-notch network, but Telecom's capital investment has since fallen below the rate of depreciation. More than 95 percent of net earnings since privatization have been redistributed, rather than reinvested, and Bell Atlantic has reaped NZ\$2.23 billion (US\$1.45 billion) in gains on the \$1.78 billion it paid for its 50 percent stake five years ago.

Such is the hunger for services here. New Zealand should be the world's telecommunications laboratory, but the culture of delay makes us more like a cash cow. To be fair to Telecom, its obligations under the Kiwi Share do not come cheap. Whatever the merits of a voluntary unbundling such as that undertaken by New York's Rochester Telephone last year, it would be unreasonable to expect Telecom to risk strangling the bountiful returns to its shareholders.

So where does that leave us? Better off than most of the world, but short of where we might be. I suspect we will end up with a version of Australia's National Competition Bill, applicable to the delivery of all utilities. New Zealand has lessons for the world. Deregulate, but do so wisely.

Russell Brown
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Cool New Thingies

I have enjoyed your magazine for the past couple of years and learn gigalots of stuff in every issue. I do think, however, that the Fetish section leans perilously close to a yuppie toy store à la Sharper Image. I like finding out about cool new thingies, but you risk coming off as not so cool or hip or cutting edge if you stray too far from your areas of technoexpertise.

As a longtime bikie (bikies pedal their machines, bikers ride Harleys), I would suggest that Specialized Ultralight Composite wheels (Fetish, *Wired* 3.11, page 71) are nothing new. Those particular wheels were introduced three or four years ago. And while there are many other nonspoked wheels out on the market, all of which are aerodynamically superior to traditional 32-spoke wheels (or those with 28, 24, or even fewer spokes), the fact is that aerodynamics is only one consideration. Equally important is weight, and even with the tremendous advances in carbon-fiber composites, these Ultralights are perhaps 15 to 20 percent heavier than tried-and-true spoked wheels.

Shall I go on? The effect of a crosswind on the handling characteristics of various wheels? Vertical versus lateral rigidity, which affects the transfer of pedaling power to the ground? All of which determine why the wheel of choice for professional road racing is still spoked.

Sean D. Williams
Tokyo

Telecom, Italian Style

Nicholas Negroponte praises the benefits of the Italian government-controlled monopoly, which has decided to swallow the initial cost of installing fiber, instead of a fiber-coax hybrid, all the way to the home ("2020: The Fiber-Coax Legacy," *Wired* 3.10, page 220).

Negroponte's argument is wrong on two counts.

The first is economic. If a government decides an infrastructure is of national interest, the correct way to fund it is with taxpayer money. American telcos believe the payback of fiber to the home is too distant and uncertain to satisfy their shareholders, without whose money they could not even lay the fiber-coax. If the shareholders of Telecom Italia want more yield from their capital and seek to invest in another multimedia initiative, they cannot: Telecom is a monopoly; there is no alternative. Telecom finances its investment through phone bills; its customers pay, even if they never use the bandwidth.

The second count is competition rules. Telecom is neither foolish nor generous. All it wants is to prevent other companies from laying fiber, coax, even copper wires in the cities. Would American citizens rather have all fiber or the option to choose among a dozen telecom operators?

Governments can sometimes achieve spectacular results without relying on free enterprise. Sixty years ago, some of Negroponte's compatriots admired the Italian government because the trains arrived on time. That was a short-term success. Long-term success and growth can come only from a free market — especially in the multimedia future Negroponte is working so effectively for.

Senator Franco Debenedetti
Rome

Undo

• Ur.... The correct URL for Maja Mataric's Web site ("Fast, Cheap, and Very Polite," *Wired* 3.12, page 49) is <http://www.cs.brandeis.edu/~maja>. • We were dead wrong when we said that Kurt Cobain died in 1995 ("This Server's Dead-On," *Wired* 3.11, page 194). The singer passed away in April 1994.

Send your Rants & Raves to:

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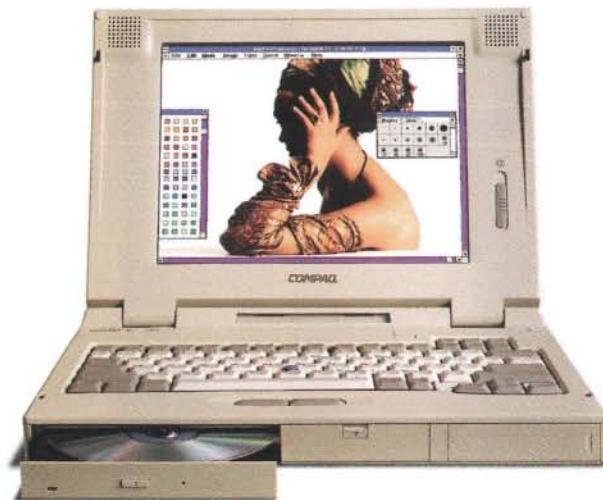
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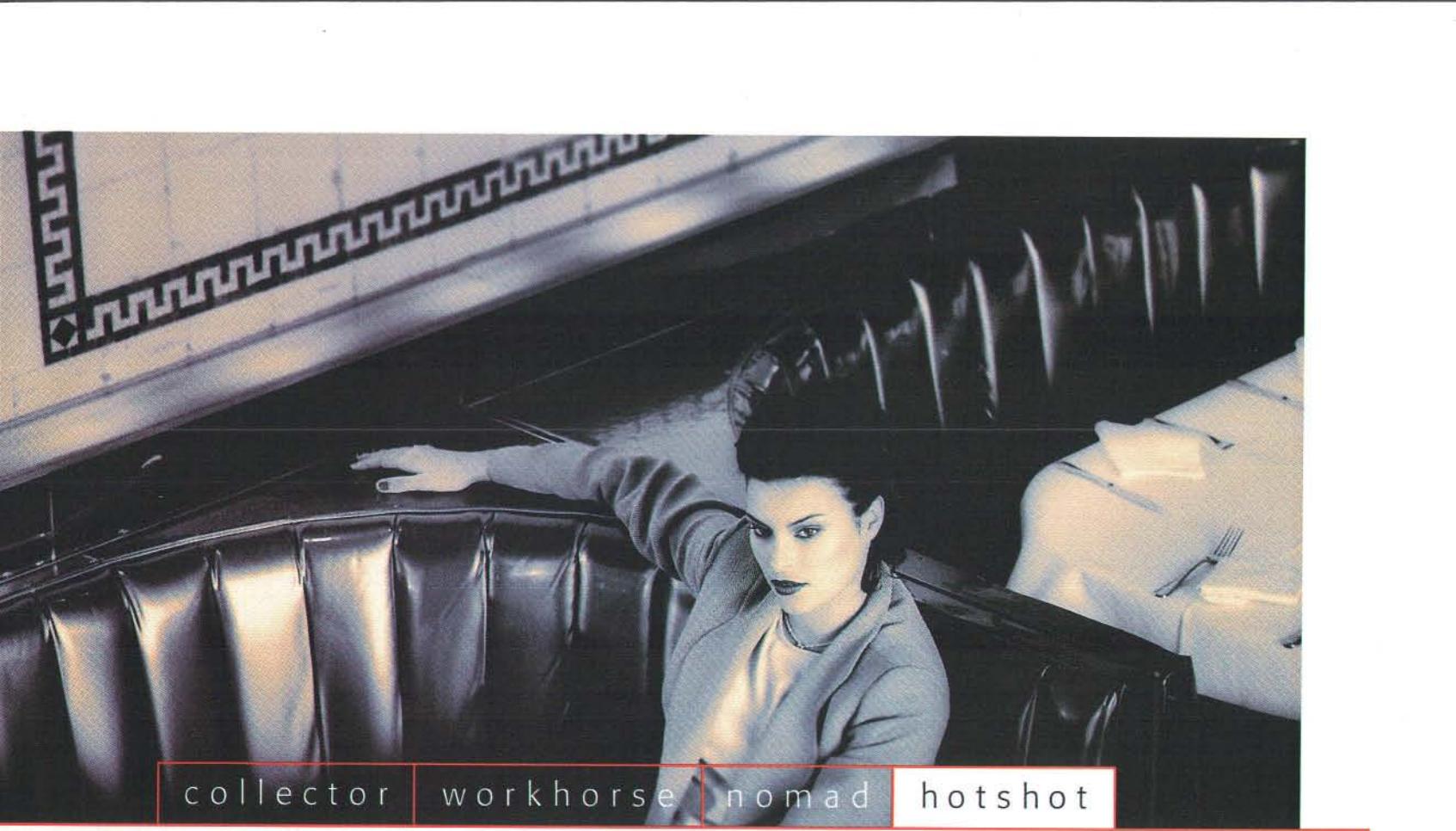
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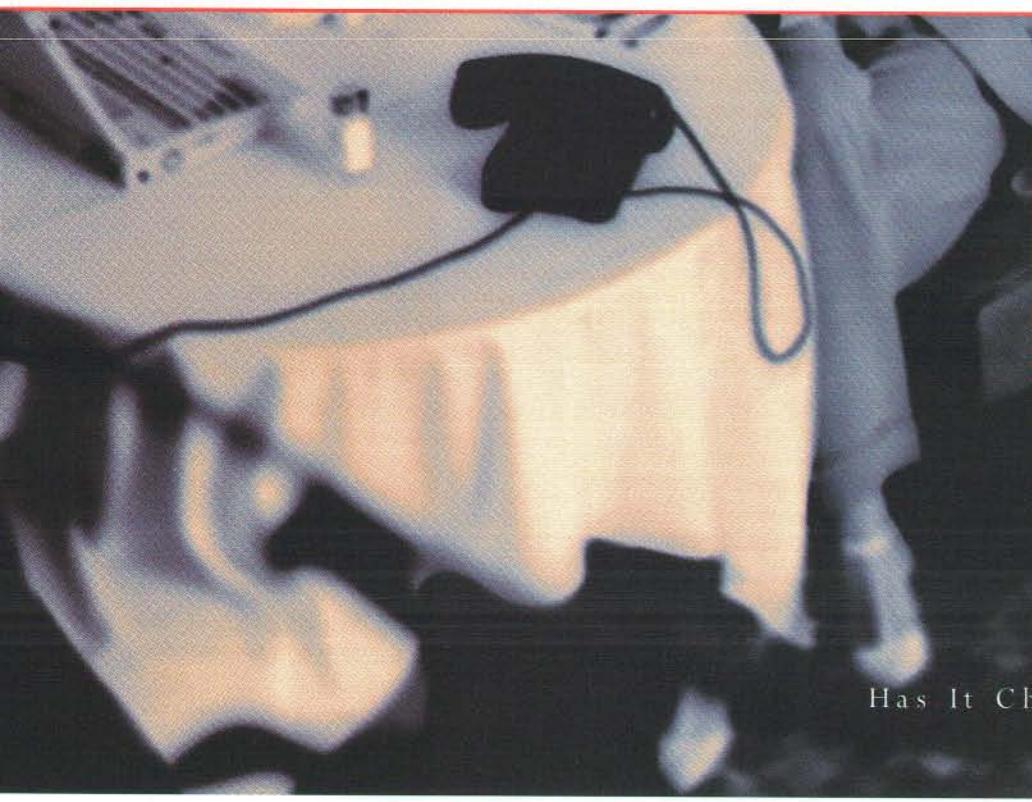
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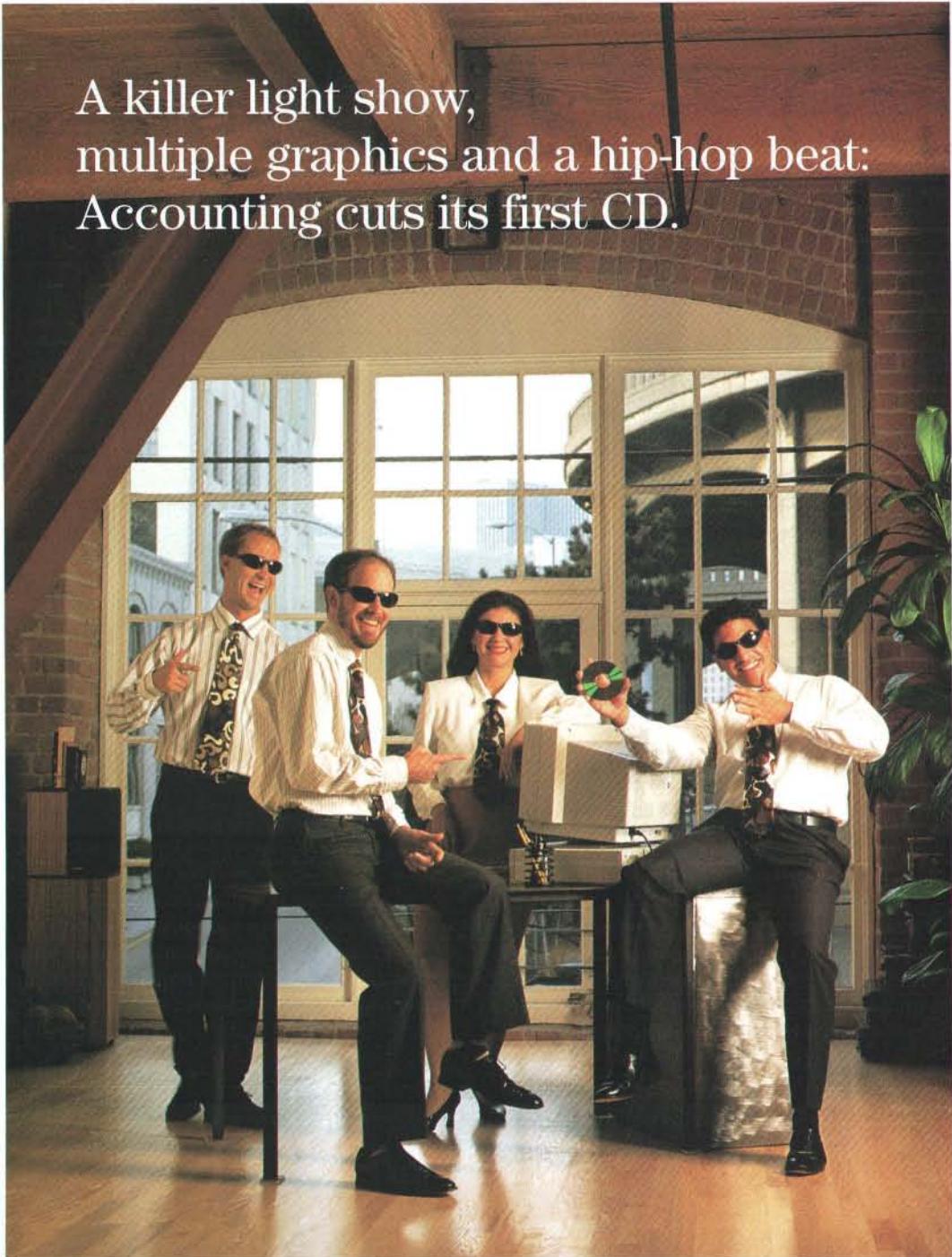
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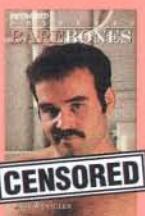
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Virtual Virtue

Shortly after joining Downtown AOL (America Online's virtual shopping mall) last September, ATKOL Video owner Jeff Satkin got word from AOL that his catalog of gay video titles would be temporarily removed from the shopping site and replaced with an abridged version that

contained only AOL-approved titles. Blacklisted were *All the Right Stuff*, *Bare Bones*, and *Night Maneuvers*, while *All Men Do It*, *Bareback*, and *Nights in Black Leather* made the cut. When Satkin demanded to know Downtown AOL's censoring criteria, he was informed that the administrator makes the call on a case-by-case basis. Satkin's conclusion:

"They just wanted me outta there." Satkin has since put up another ATKOL Video site at <http://ATKOL.com/video>. Although AOL has offered to refund him and call it even, Satkin plans to keep his page – without any listings on it – at Downtown AOL until the American Civil Liberties Union decides whether it can press charges. – *Jehanne Henry*



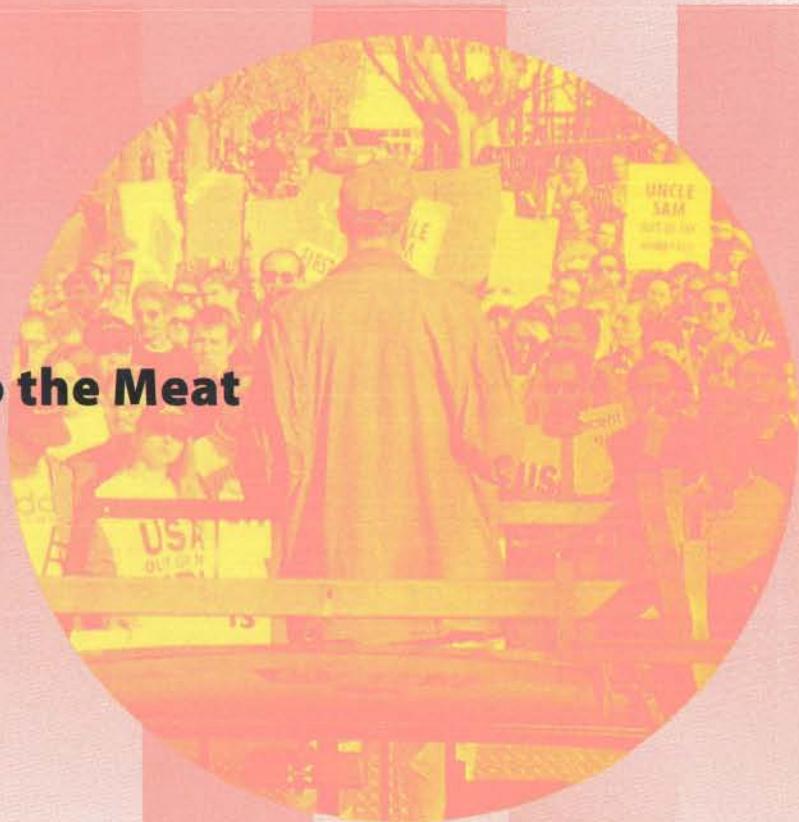
ELECTRIC WORLD

Standing in San Francisco's South Park last December, the city's digerati demonstrated that if it takes protesting in the meat to protect cyberspace, they're good for it. One of three rallies held across the US, the event featured speakers such as Mike Godwin of the Electronic Frontier Foundation, online activist Jim Warren, and the American Civil Liberties Union's Dorothy Ehrlich. They addressed a midday crowd incensed by the Communications Decency Act of 1995.

Railing against elected officials who don't get – literally and conceptually – either e-mail or the Net, speakers called the bill indecent, charging that Congress was trashing the First Amendment.

"We have to show," declared author Howard Rheingold of free speech on the Internet, "that it is not just for some geeks in San Francisco." Quoting James Madison, he warned, "A popular government without popular information, or the means of acquiring it, is but a prolog to a farce or a tragedy. Or perhaps both." – *Brad Wieners*

Taking It to the Meat



Microsoft Moves

If content wants to be free, why do so many companies want to do content? In a recent wave of unlikely online media alliances, MCI hooked up with News Corp., and various phone companies found partners in Hollywood. Now Microsoft is joining NBC to create a cable network and online news service with the catchy title of MSNBC. (We're guessing the name is Microsoft's idea.)

Microsoft is no newcomer to content. Through its hot-selling CD-ROM products and Gates' purchase of the Bettmann Archive, a nice little side business is being created. So if the network is becoming the computer, why

can't Microsoft become a network?

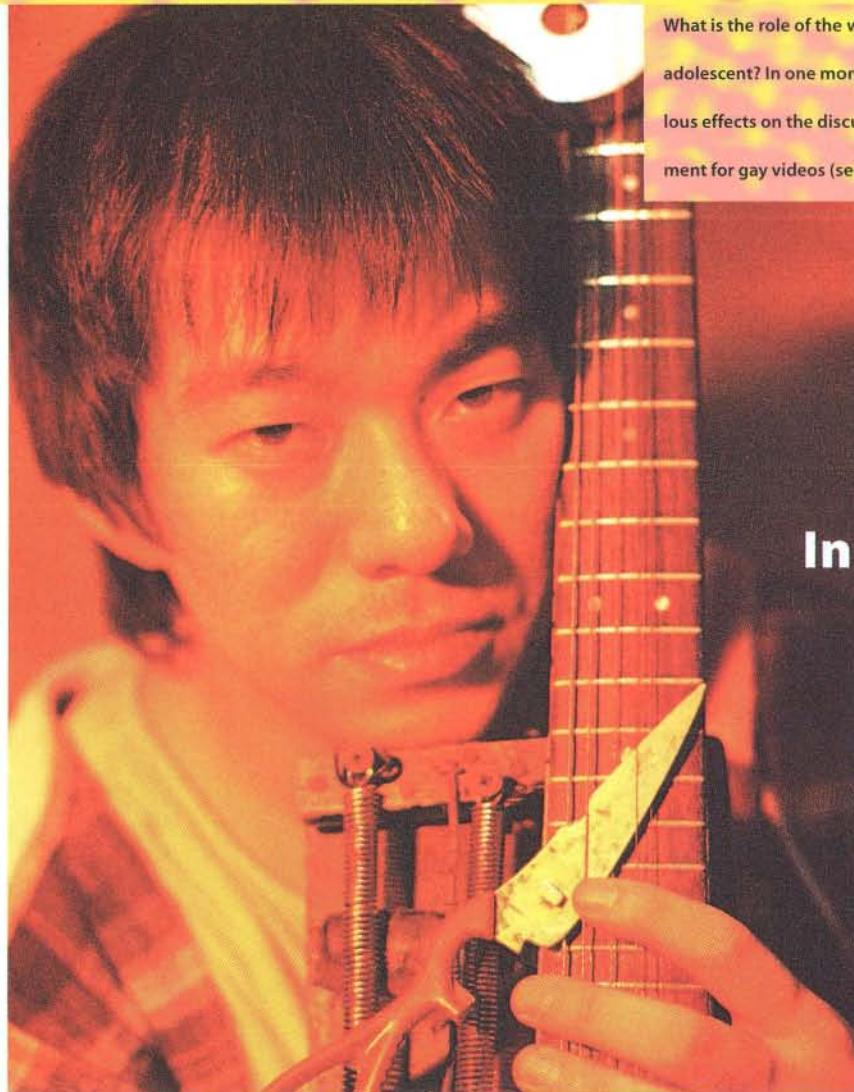
But there's a downside. Microsoft never co-branded Windows, as in Compaq-Windows 95; such a move would have antagonized other hardware makers. By cozying up to NBC, Gates risks alienating all the other media companies he'd like to sell his Tiger media servers to, not to mention operating systems and business software.

It's one thing for Microsoft to flatten small software companies, another to take on media giants. As Microsoft expands, it must be careful about attracting, as *Wired* put it last year, a critical mass of enemies. —Andrew Anker

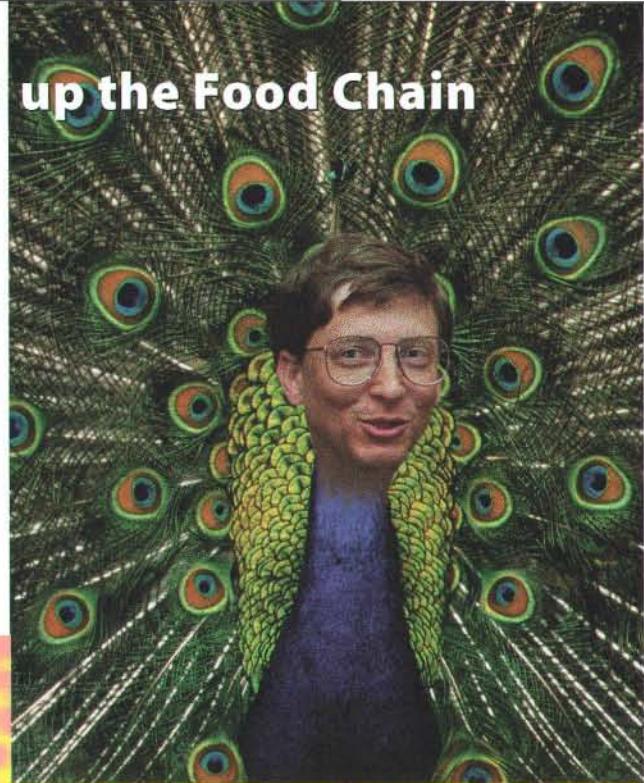
III So, This Is America, Online: The news streaming out of Vienna, Virginia, is at once funny, frightening, sad, and downright stupid. In a recent interview in *Broadcasting & Cable*, America Online

President Steve Case joked that his company's slogan could be "AOL: Just a little less pathetic than

the other guys." Depends on who the other guys are, eh? Certainly most of them can't tell 4 million people what they can and cannot discuss, purchase, and read. Which begs the question:



up the Food Chain



What is the role of the world's largest online service? Overweening mother? Dictatorial enforcer? Gawk adolescent? In one month, AOL banned the word *breast* (then rescinded the ban upon realizing its ridiculous effects on the discussion of breast cancer) and arbitrarily censored a legitimate, text-only advertisement for gay videos (see page 35). Or was it arbitrary? The title *Black Magic* was nixed, but *Magic Choices* ▶

In fected

Otomo Yoshihide is a sampling guerrilla with an omnivorous taste for vinyl, improv virtuosity, and daredevil antics. These have made him the lightning rod of the Japanese noise-rock underground. To Yoshihide, a sample — be it a scratched record, a sound bite, hypertext, or infotainment — is little more than a virus infecting us with its message. In the apocalyptic collage of "Revolutionary Pekinese Opera" by his hardcore sextet Ground-Zero (Trigram in Japan), Yoshihide quixotically battles these toxins by willingly infecting himself: "You do not necessarily have to kill a virus. Living peacefully with it is also an option." Sampling Virus Project: fax +81 (424) 68 2166. Trigram: fax +81 (44) 751 7847. —Andrew Jones

Where Cool Girls Rule the Web



Foxy chicks paint their bedroom walls purple, run through sprinklers, flirt with skater boys, eat strawberry Pez, and laugh at the world. So say Clea Hantman (left), 28, and Keva

Marie, 24, creators of the Foxy! Web site at <http://www.tumyeto.com/tydu/foxy/foxy.htm>.

Contributors hail from around the globe, while bright backgrounds and graphics of crayon-

colored stars signal the editors' quirky personalities.

"Boys are a favorite topic among our most frequent readers," says Hantman, "but we plan to focus more on strong-ass

chicks, the kind who work their behinds off, the kind who spin their creative webs for the world to see. The way to inspire young women is to show them what we can do." —Bonnie Burton

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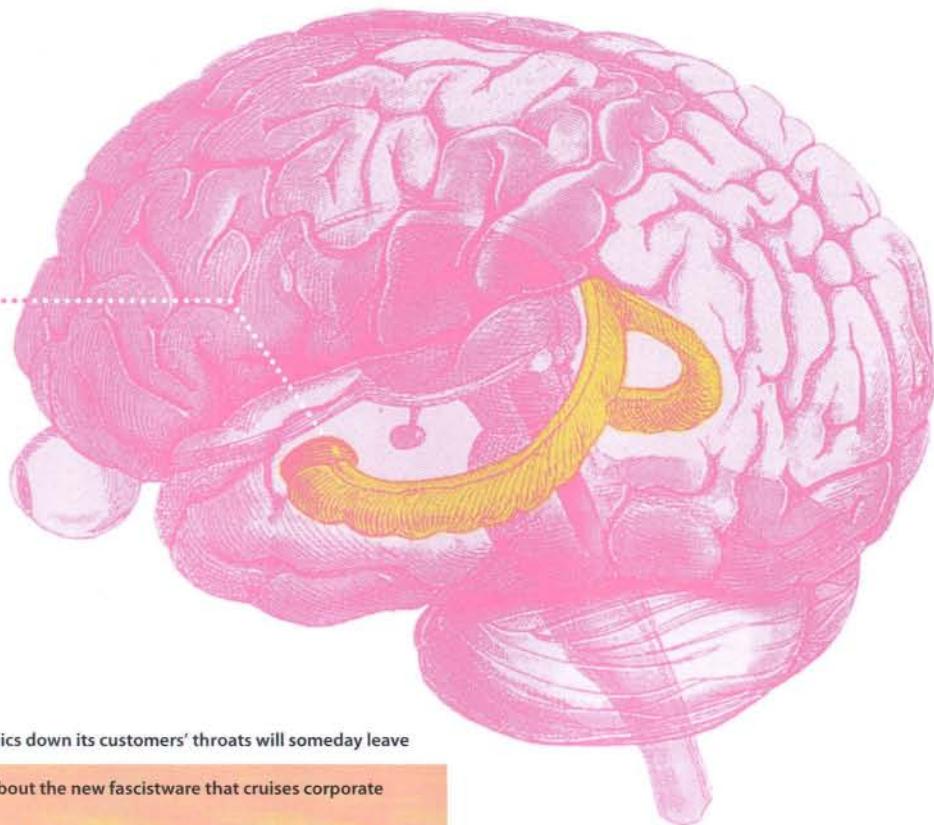
WHAT DID YOU HAVE IN MIND?™

Novelty Detector

The hippocampus - a tiny, seahorse-shaped organ in the brain - filters and classifies incoming information and sends it to other parts of the brain to be stored. And as Mark Gluck, a psychologist and computer scientist at the Center for Molecular and Behavioral Neuroscience, believes, the organ's special talent is novelty detection. It notices anything new or different - with amazing speed and sensitivity.

Gluck's software, modeled on the hippocampus, has now been underwritten by the US Navy to help detect cracks and worn gears in helicopter engines before the wear and tear cause a fatal crash. The software has already confirmed a significant problem in one batch of rebuilt engines. Gluck also hopes that his software will be used in heart and brain monitoring, alerting nurses to possible seizures and heart attacks. Gluck's homepage: <http://www.cmbn.rutgers.edu/cmbn/faculty/gluck.html>.

- Jill Neimark



► was not. AOL's repeated attempts to cram middle-of-the-road broadcast ethics down its customers' throats will someday leave

the company standing in a puddle of puke. **III Speaking of Which:** Heard about the new fascistware that cruises corporate networks in search of games? UnGame finds files matching any of the 3,000-plus titles in its index then summarily erases them from local drives. Made by DVD Software in Irvine, California - phone them at +1 (714) 757 0615 - UnGame targets the "US\$50 billion a year" in lost productivity because of *Tetris*, *Doom*, and their ilk. Bean counters beware: install this software, and watch your productivity walk right out the door. **III Higher Density:** The next-generation compact disc has arrived, and it will hold 15 to 17 times the amount of information contained on a stan-

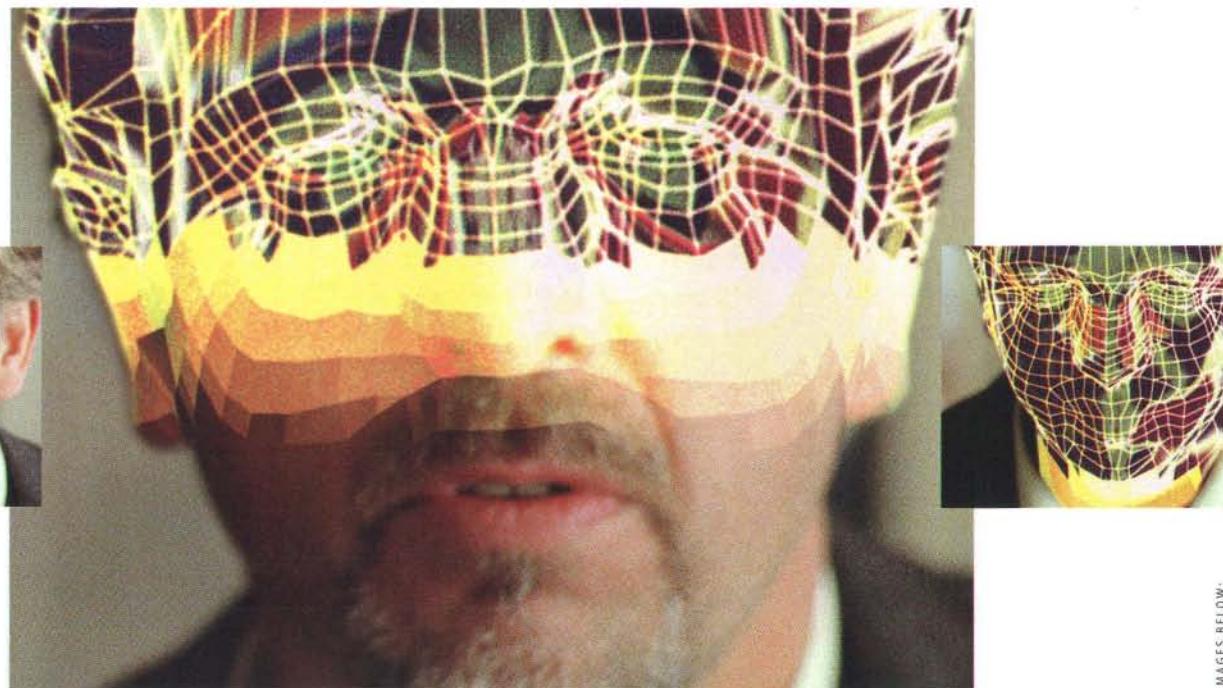
dard CD (currently about 650 Mbytes). The platter, labeled "digital versatile disc" (or DVD) by a marketing-impaired

Recon director Breck Eisner and producer Steve Cantor are no ordinary film school students, even by the silver-spoon standards of the University of California, Los Angeles. Eisner, 25, is the son of Disney chair Michael; producer Cantor, 27, received an Oscar nomination two years ago. Still, they managed to produce their eight-minute sci-fi thriller, starring



Peter Gabriel, for an underprivileged US\$30,000 in cash (and plenty of industry favors). Keep an eye out for the *Recon* Web site, where Eisner and Cantor will share their secrets for penny-pinching pictures. - Paula Parisi

Low Budget, High Tech



IMAGES BELOW:



T I R E D

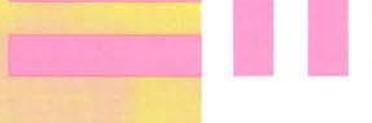
Internet backlash
Microbrew beer
TV commercials with URLs
Pat Schroeder
Stealth parentage
X-Men
"Must See TV"
Personal homepages
God
Andrew Shue
Toy Story action figures
Apple Newton
Modern primitives
Loans to Third World governments
FTC, DOJ
'70s fashion nostalgia
Brute-force cryptanalysis
Rocket Science
Veganism
Stealing car radios

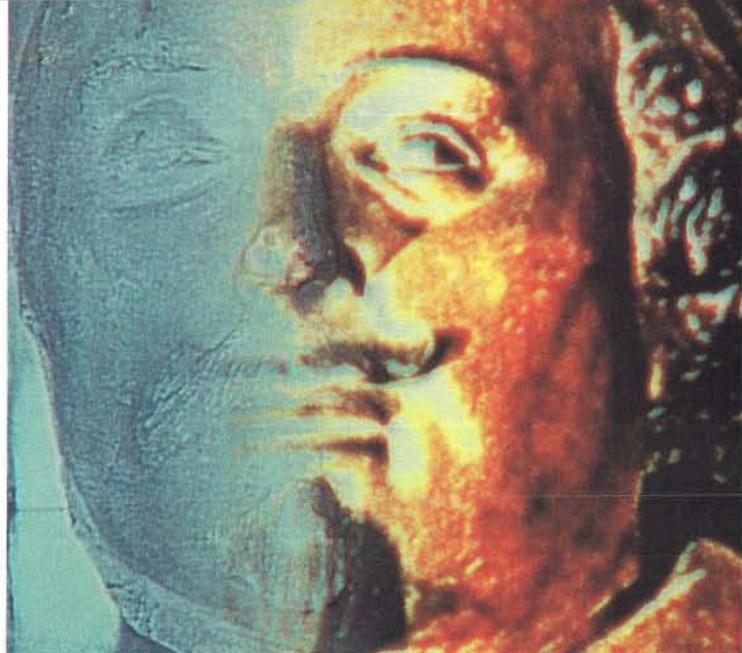


WIRED

Homepage backlash
Microbrew cola
TV commercials for URLs
Her retirement
Selling out
Peanuts
Watching CBS die
Your own alt.fan newsgroup
Omega Point Theory
Elisabeth Shue
Vintage Burger King theme glasses
Sharp Zaurus PI-5000
Neo-Victorians
Microenterprise development
The marketplace
'80s videogame nostalgia
Timing-attack cryptanalysis
Psygnosis
Pica eating disorder
Stealing air bags

electronics industry, will be available

this fall. Of course, you'll need new players – at US\$700 a pop.  Microsoft Modesty: This from the company's lengthy explanation of unlicensed software and its evils (<http://www.microsoft.com/Piracy/intlrep.htm>): "Due to the high quality, popularity, and depth of the Microsoft product line, Microsoft products are particularly vulnerable to all forms of software piracy."  Bill's Blunder: We figured the CD-ROM nestled into each new copy of Gates's *The Road Ahead* was an after-thought (marketing rep to Gates: "Holy cow, Bill – we can't have a book about the future that doesn't ▶")



A police computer technique used to identify war criminals has proved the authenticity of a William Shakespeare death

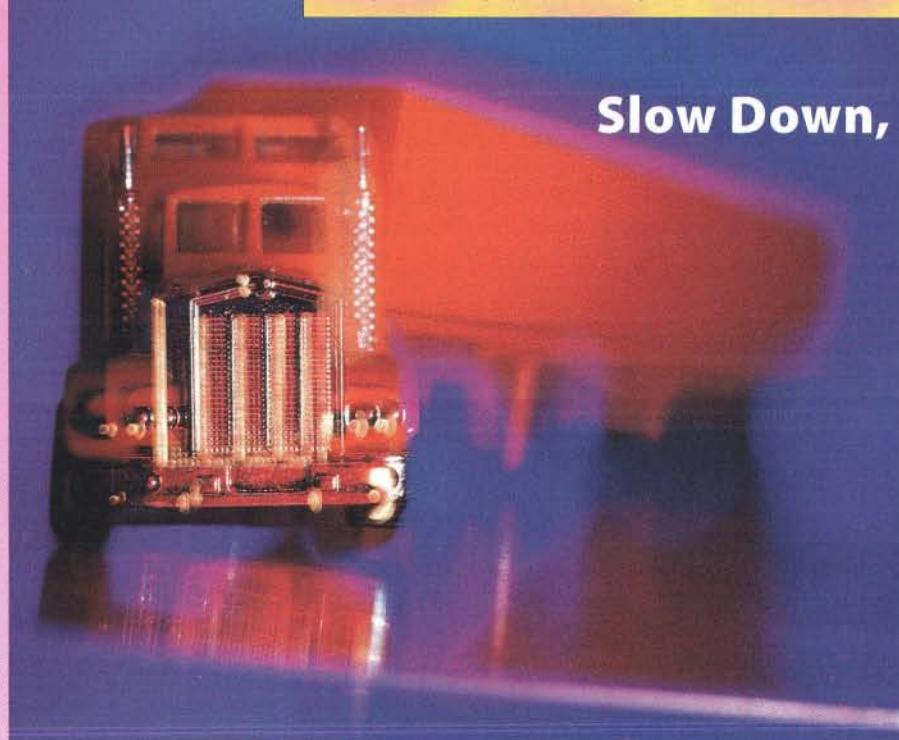
FBI), which digitized the mask to morph it with the face of the Stratford Bust, a statue of the bard. The professor says the

Age Cannot Wither Him

mask, claims Professor Hildegarde Hammerschmidt-Hummel of Mainz University in Germany. The professor consulted the Bundeskriminalamt (the German

results leave "no doubt" that the man in the mask was Shakespeare, though she adds that academics in the playwright's native Britain are skeptical. – Jane Szita

Slow Down, Mack!

 A new computer system now acts as a back-seat driver for truckers heading westbound out of the Eisenhower Tunnel near Denver: electronic road signs flash to each 18-wheeler the recommended speed for traveling down the treacherous mountain pass after a sensor in the truck lane detects the size and weight of every semi leaving the tunnel.

Colorado hopes this new technology, the first of its kind in the world, will cut down on accidents. On that stretch of I-70, there have been 206 runaway trucks since 1986 – 19 of them involved injuries.

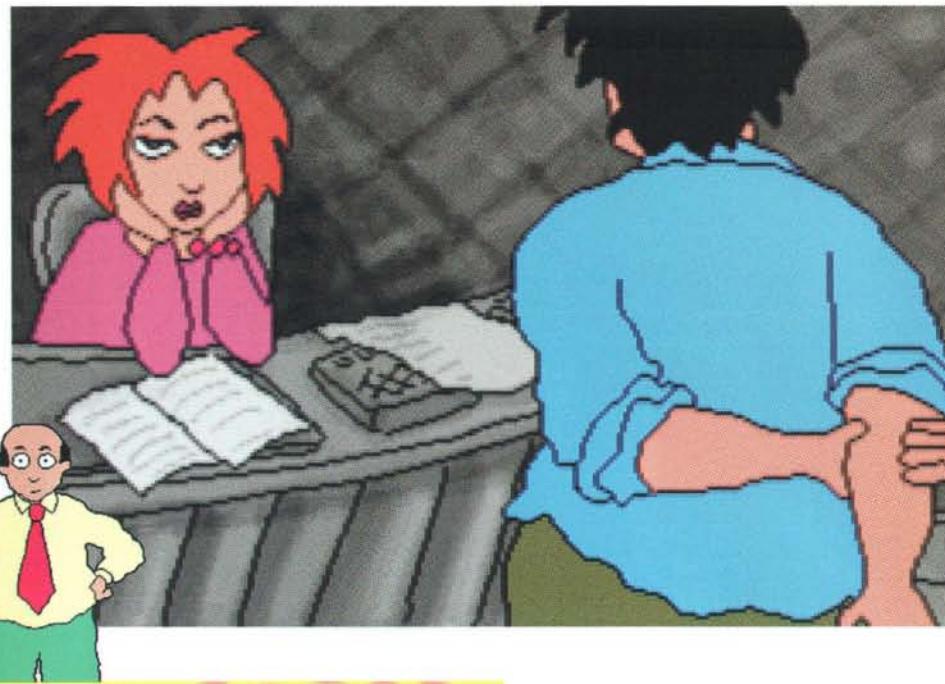
Will truckers heed the digital warnings? The Colorado Department of Transportation plans to find out. Another computer sensor, farther down the highway, checks to see if drivers followed instructions. – Gregory Dauer

Intentional Mistakes

While other computer animation companies toil toward Disneyesque perfection, the Emmy-Award-winning *Dr. Katz, Professional Therapist* – Comedy Central's quirky cartoon sitcom with squiggly characters and charmingly naturalistic dialog – is the result of faux flaws: meticulous computer-generated carelessness.

Tom Snyder, creator of SquiggleVision and Retro-scripting, explains the secrets to the show's imperfect, human touch. Animators cultivate inexact renditions as they trace an original drawing. These tracings are looped and – presto! – neurotic Dr. Katz and his couch-potato son squiggle in a lovable motion that, Snyder says, "adds to their frantic insecurity."

With Retro-scripting, a computerized editing system takes off-the-cuff comments, improvised dialog, and out-of-context speech, then reorders them to create a realistic script with a wealth of spoken irregularities. – Erika Milvy



► include a CD-ROM!"), and we were proven right when irate readers started swamping Microsoft and book publisher Viking with calls.

Seems Microsoft forgot that a CD-ROM is a piece of software – hence, it needs technical support. In fact, it *really* needs technical support:

the first version of the disc was not compatible with Microsoft's own Windows NT. Oops. ■■■ Reading the Oracle: Atop the list of Wintel bashers, of course, is Oracle's Larry Ellison, who has convinced his troops that the Wintel standard is the devil incarnate. Oracle, you will recall, is leading the charge of the PC-lite brigade in its quest to create a stripped-down,

US\$500 Web box. When a senior executive was asked how Oracle decided which elements to delete, he replied succinctly, "There was no debate – we took out the Pentium and Windows." ■■■



Sissies

Richard Wang (right), a New York University Medical School student, pined for the good old *Sassy* (which had been sold to a new publisher and disabused of its pesky feminist sensibility and funny writing). He decided to risk a promising dermatological career by putting the entire lost issue of the original

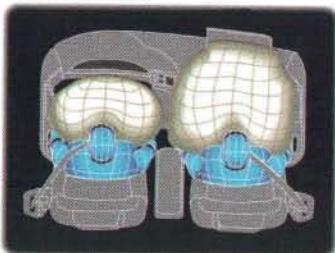
Sassy on the Web.

Unite With help from Brian Nunez (left), Wang obtained battered photocopies of the completed-but-never-printed December '94 issue. The redesigned result is called *Sissy* to divert the lawsuit-happy. Check out the special all-celebrity-written extravaganza, featuring Joey Ramone's makeover: <http://www.youth.org/zines/blair/sissy/>. Rad! – Marjorie Ingall

Before Stratus hit the streets, it was hit from the front, the side, and from behind in hundreds of computer simulated crashes.

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*See limited warranty & restrictions at dealer.
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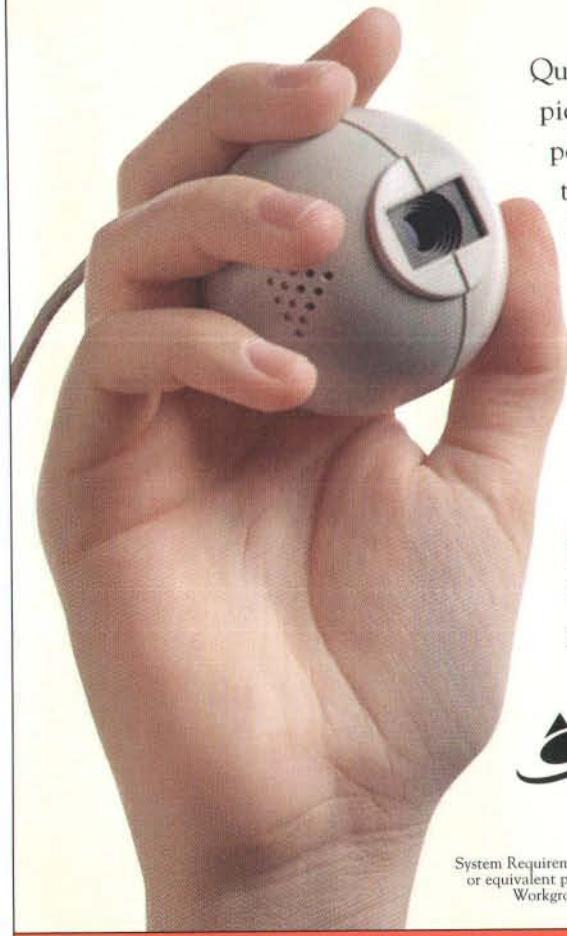
This is one instance where it was good the computer crashed.



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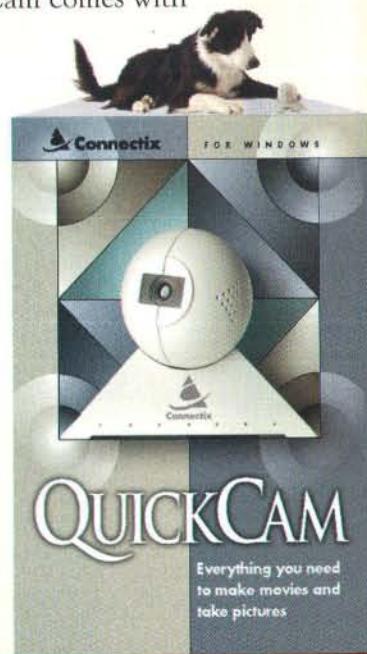
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MAKE MOVIES



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TAKE PICTURES



BE CREATIVE

scans

Big Sound

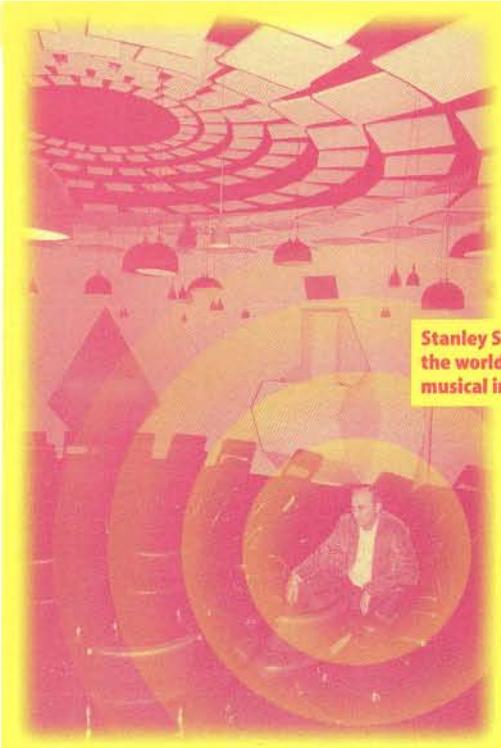
Stanley Shaff appears at a curtained doorway. "Welcome," he says smiling, his voice low and rich. "Please come in."

Through a short labyrinth, you follow him into what looks like a futuristic bomb shelter – a rounded room with high slanting walls, an observation deck on one side, and chairs that spiral out from the center. Sitting down, you note what appear to be tiny lights hanging from the ceiling – until you realize they're speakers. The room is jammed with speakers: they protrude from the corners, are mounted like heat ducts in the floor, and rise to form a monolith in the middle of the room.

You have entered Audium, a house-sized musical instrument of 169 speakers – a unique performance space where sound assumes spatial, kinetic, and communicative qualities. Started with a grant from the National Endowment for the Arts 20 years ago, Audium remains one of San Francisco's undiscovered treasures, a testament to a little-explored direction for music and sound. As the man behind the curtain, Shaff is Audium's co-designer and promoter, ticket taker, and sole performer. Twice a week, he "plays" the space for live audiences.

"I work from two fundamental concepts," Shaff explains. "The idea that the motion of sound can be an element of musical composition, and that the space itself is an essential part of the work."

The lights dim to black, and the show begins. Using prerecorded noises and Audium's technological capabilities, Shaff silently creates tactile, multidimensional aural sculptures from his darkened post. They range from



Stanley Shaff sits inside the world's largest musical instrument.

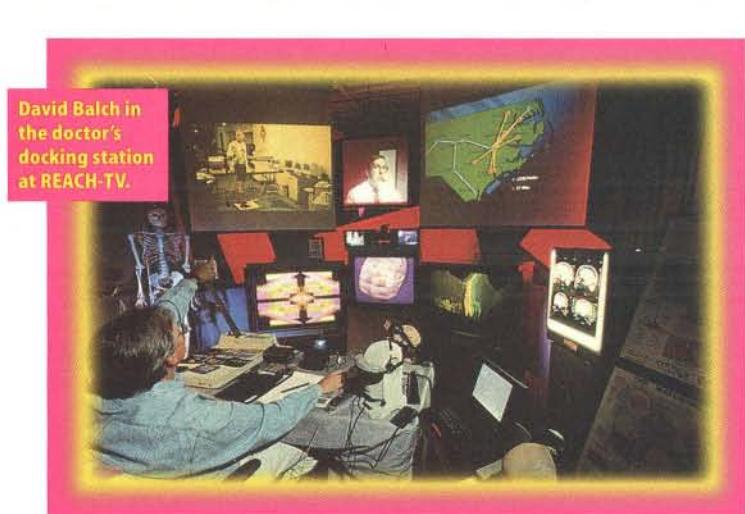
airy soundscapes to claustrophobic aural nightmares. At times, cartoonish chirps ping-pong madly around the room, and everyday noises – planes overhead, pipes in the walls – transmogrify into short, atonal passages of synthesized music. Late in the program, a freight train shudders through the room.

"When you push and move music," Shaff says, "you're introducing a whole new dynamic of harmony, melody, rhythm – and now energy, or space. Audium challenges some basic assumptions about sound. It's kind of a musical threat." Audium: +1 (415) 771 1616 (<http://www.slip.net/~audium>). – Colin Berry

THE LIST

Net Rep

Gather around The List (<http://www.thelist.com>) and find out if the Internet service provider you're considering is right for you. This Web site's searchable database has information on more than 1,500 service providers, including phone numbers, pricing, features, and – best of all – comments and ratings from other users.



David Balch in the doctor's docking station at REACH-TV.

Dr. Video

Dr. William Wooden is examining a barely visible blemish on the cheek of Kathleen Snyder. "It looks like a pigmented intradermal nevus," says Wooden, reassuring Snyder that what she has on her face is a mole. Just another day at the doctor, right? Actually, no. Wooden, working in his office in eastern North Carolina, is looking at a video image of Snyder, who sits three time zones away in the Los Angeles Convention Center.

"I'm very impressed," grins Snyder, one of more than 80 people who received a telemedical consultation during Siggraph. "Can you imagine having this in your home? I want it

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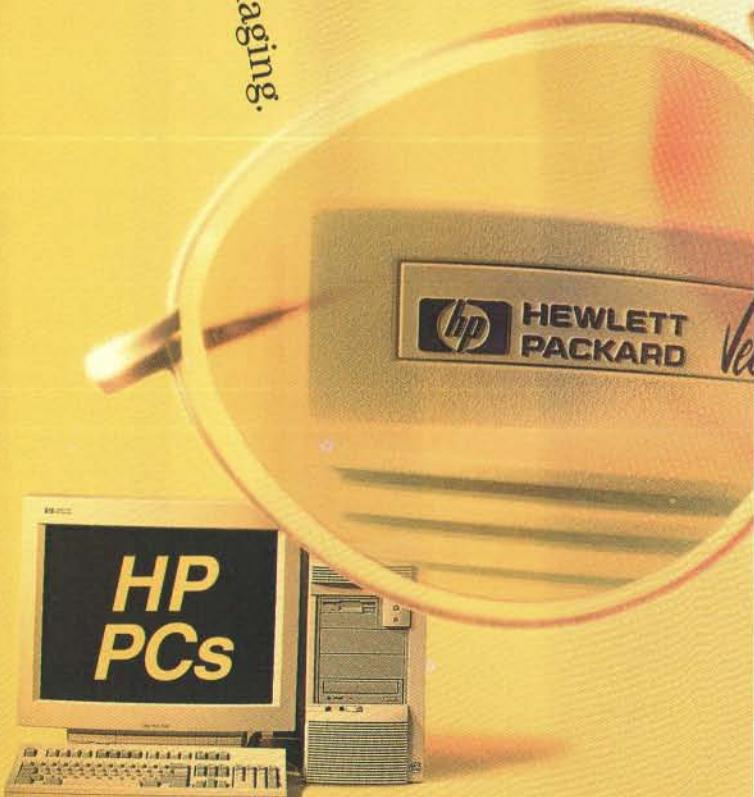
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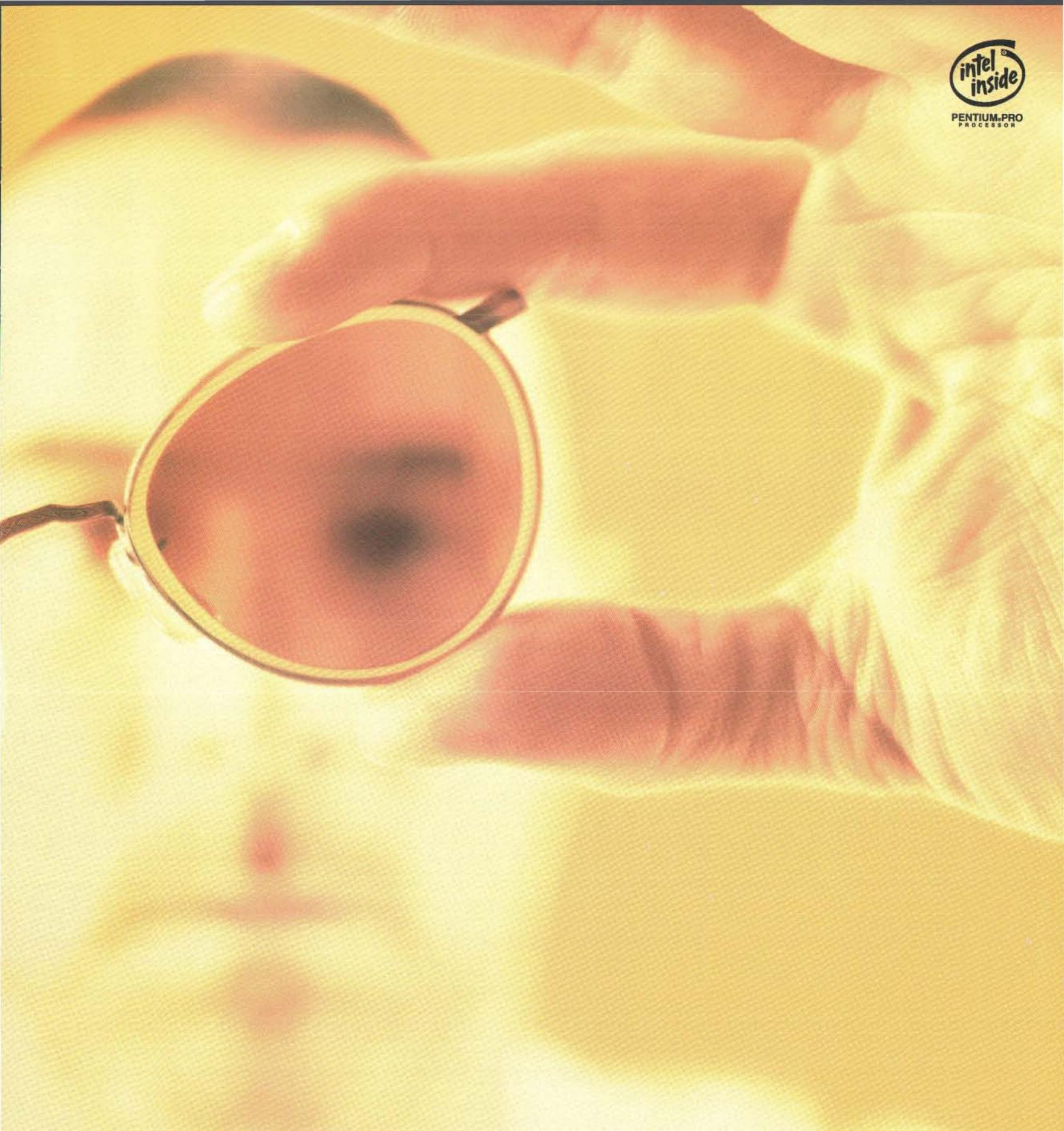
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pumped into my living room."

Glowing responses like these bring a smile to the face of David Balch, director of the Rural Eastern Carolina Health Network (REACH-TV). No country bumpkin, Balch heads up the East Carolina University School of Medicine's Center for Health Sciences Communication in Greenville, North Carolina. After earning a

Fun aside, REACH-TV "is a needs-driven project," Balch stresses, "not a let's-go-and-play-with-technology thing." Indeed, eastern North Carolina is in desperate need of better health care: in 1988, its infant mortality rate was one of the highest in the nation; of the 100 counties in North Carolina, 18 have no hospital, 20 have no obstetrical services, and two have no physicians.

REACH-TV began in early 1992 when the medical school wired Central Prison, the state's largest correctional facility, 100 miles away in Raleigh. Since then, the project has expanded into four rural hospitals, one ambulatory clinic, and a Marine base.

It takes more than a souped-up videoconferencing system and a cutting-edge computer network to make telemedicine work. The cornerstones of REACH-TV are its four telemedical suites - soundproof 6-by-12-foot chambers stocked with virtual medical instruments: viewing monitors, electronic touch-screen displays, digital stethoscopes, teleradiology scanners, and various high-resolution cameras used by nurses and physicians. Coupled with computerized patient records and scheduling software, the suites form the basis of an integrated health care information system.

But are patients willing to have the cold hand of technology mediate the doctor-patient relationship? "Once the patients see the physician face to face on screen," says Balch, "they forget where they are. All the barriers fall. Within a minute or two, they're telling really personal stories." - Spencer E. Ante

Wired Top 10 Mail-order catalogs (US)

Rank and Company	1994 Sales (in Millions)	Type of Business
1. JCPenney	US\$3,817	General merchandise
2. Dell Computer	3,420*	Computer hardware
3. Gateway 2000	2,600*	Computer hardware
4. DECDirect	2,000*	Computer hardware
5. Spiegel	1,742	General merchandise
6. Fingerhut	1,719	General merchandise
7. Lands' End	990*	Apparel
8. IBM Direct	950*	Computer hardware
9. L.L. Bean	848	Apparel
10. Micro Warehouse	776.4	Computer software

Note: (*) denotes estimate.

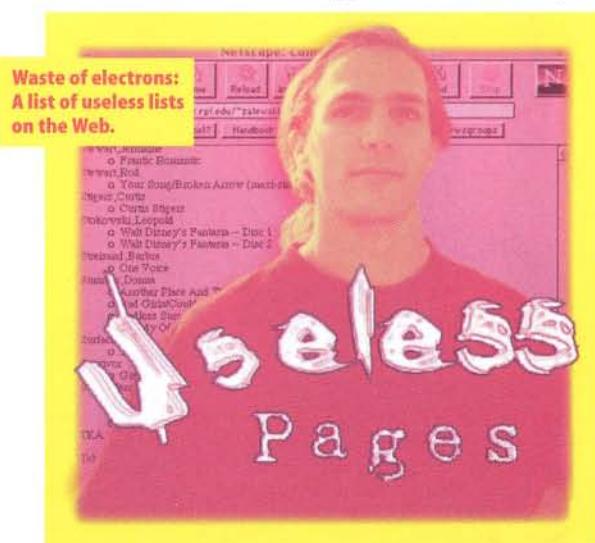
Source: Catalog Age Online (<http://www.mediacentral.com/>)

- Gareth Branwyn

master's in telecommunications, Balch moved to North Carolina and got a job running the audiovisual department for the medical school. Twenty-two years later, he's still there - and having a ball. Balch is a bit of a Renaissance man: he's shown computer animations at Siggraph, directed music videos, and even produced an hour-long concert by the Pointer Sisters. "I like to do fun stuff," he says. "Now, telemedicine has replaced music videos."

Totally Useless

Programmer Kenny Zalewski owns 613 music CDs, from ABBA to Hans Zimmer. What does he do? He types the whole list up



and puts it on his Web page (<http://www.cs.rpi.edu/~zalewskk/disclist.html>). Internet consultant Paul Phillips then stumbles across Kenny's list, and he's dumbfounded - after all, it's useless. "It broke my ridiculous filter all at once. I lambasted it with a long post to Usenet and then realized a Web page was probably in order," says Phillips. Thus the **Useless Pages site** was born (<http://www.primus.com/staff/paulp/useless.html>).

Useless Pages catalogs a host of people's collections covering everything from CDs, tapes, and LPs, to videos, laserdiscs, and dusty old 8- and 9-tracks. Click around, and you'll also find info on CD players and a host of other gadgets you can control from the Web (read: soda machines, boom boxes, Christmas trees, hot tubs, refrigerators, lava lamps, coffee makers, telephones, Geiger counters, lights, and doors). "For crying out loud! Enough! Do you even care if your own door is open or closed?" asks Phillips.

And this, of course, is just the tip of the ice-

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berg – as you can imagine, there's a staggering amount of uselessness all over the Web. In fact, the site receives more than 100,000 hits a week and takes two people to maintain.

Buoyed by this, Phillips and network consultant Steve Berlin organized a competition to find even more useless fodder – this time the most out-of-date information on the Web. Picking up the grand prize was The Micro-mouse Contest Rules, dating back to October 26, 1990, and discovered by Michael Soltys. Now, I'm no history genius, but wasn't the WWW still a twinkle in Tim Berners-Lee's eye at that time? Mysteriously, this page was updated October 5, 1993. But "Why?" Soltys understandably asks.

The most recent contest challenged Net surfers to create a page pointing to the largest number of guest books on the Web. Winner Gerald Oskoboiny found a whopping 660. His entry has been enshrined as "The Uselessness of Guestbooks" on the Useless Pages.

But why do people put stuff like this on the Web? Berlin offers three reasons: 1) people are lonely; 2) people love to talk about themselves; 3) people love lists.

Phillips sees it otherwise. "Once upon a time, people put useless stuff up for a variety of reasons, all of which spoke volumes about human nature. Now, they just do it to get on the Useless Pages! Such is the price of success." – Amy Bruckman

Digital Disneyland

One part classroom, one part playground, one part glorified video arcade, TechTreK is taking the home out of children's home entertainment. When this "family computer entertainment and education center" opened in Rockville, Maryland, last spring, swarms of eager families descended upon it like it was a Barney convention. In its first weekend alone, more than 4,000 visitors dropped US\$6.95 per kid for the one-hour privilege of using computer terminals and a library of commercially available software.

TechTreK's creator, Dadi Akhavan, knows a thing or two about marketing. As president and co-founder of Trident Software, he's watched the hybrid "edutainment" niche explode during the past few years. "There were 230 new software titles in the first five months of 1995," he says. "There was no place out there where families could have access to these products." Drawing inspiration from "places like the Discovery Zone and Chuck E. Cheese" and blending in the sophistication of the technogeneration, TechTreK was born.

The sprawling indoor amusement park features elaborate murals and special effects designed by the team that created *Star Wars*. At the heart of the center are seven "stations" where kids can explore interactive software on science, storytelling, art, and more.

At the Take a Trip station, small visitors can cozy up to a time machine and play with software teaching history and geography. Under the lightning fizzes of Go Figure, they can try out their math and analytical skills. There's even a special section for preschoolers, where toddlers can learn to boot up before they've mastered the swing set. TechTreK also offers special classes and after-school programs and welcomes preschool groups. Leaving nothing to chance, there are classes for adults, too.



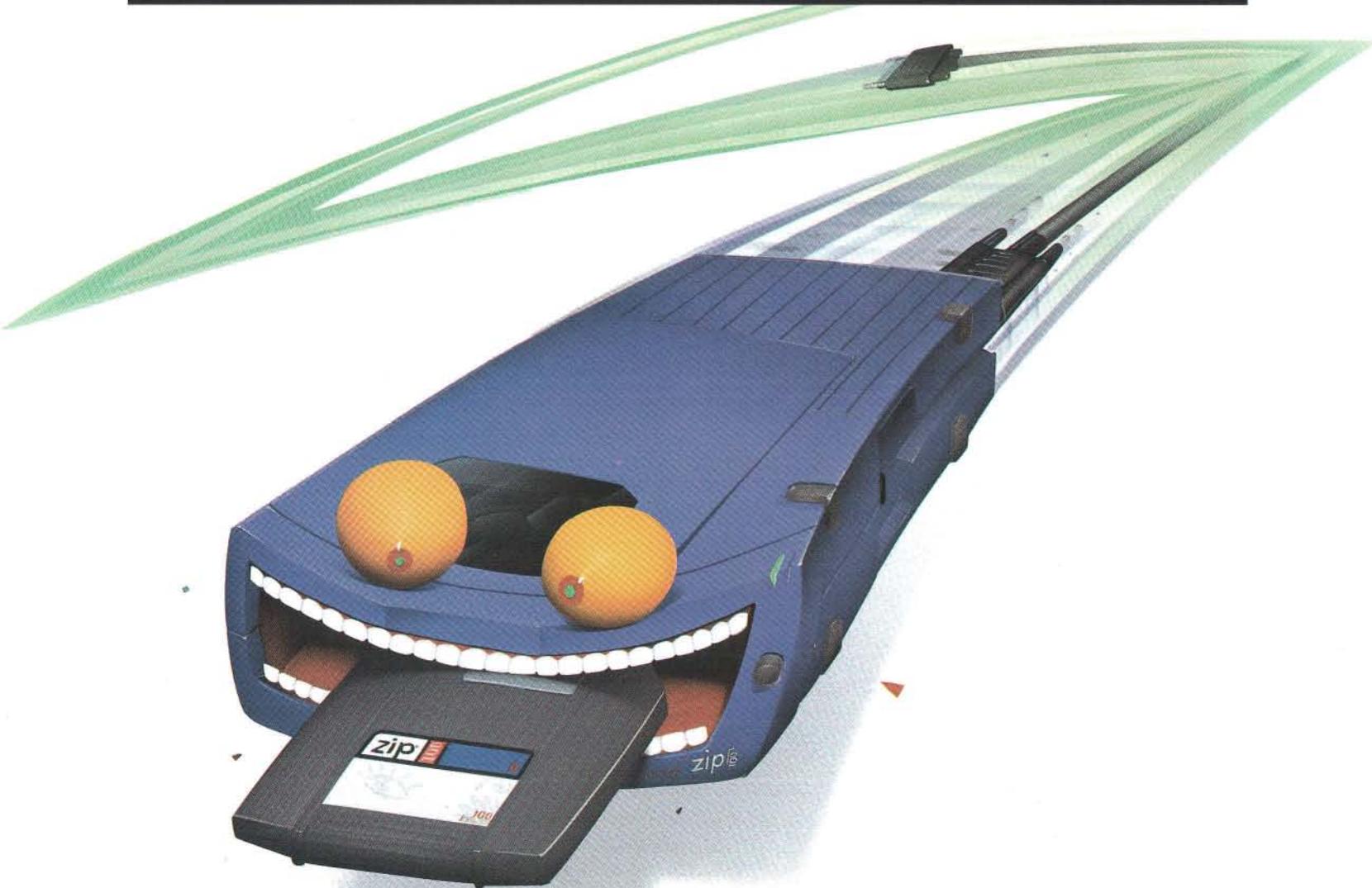
Tots can't wait to plug in to a station and suckle the glass teat at TechTreK.

Visitors are guided through the center by Trek Masters, who can answer questions and offer suggestions on how to use either the computers or the software. And while their progeny are off developing early RSI, parents can sip cappuccino in the Cyber Cafe.

It's no accident that TechTreK is located in a Washington, DC, suburb. "This is an affluent area," admits Akhavan. "Computer penetration in homes is very high – about 75 percent." So what's the allure of loading up the car and dropping some serious cash here? Part of it is social – kids get the chance to interact not only with a computer but with other children. And for parents, there's the potential long-term cost-effectiveness – especially when gauging pint-sized attention spans. "Parents come in and say, 'I spend \$50 on something, and my child played with it for a half hour,'" says Akhavan. Here, grown-ups can let their kids road-test new titles and find out if they've got the stuff that will engage the brood again and again. Naturally, when they make such discoveries and the kids are howling for a particular game they've almost mastered, there's a retail store on site.

In much the same spirit as the family cen-

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ters that served as role models, Akhavan is planning to take his digital Disneylands on the road. This year, he's opening a string of TechTreks in the Washington, DC, area and up and down the Eastern seaboard, with an eye on franchises across the country. "As we move forward, people have less time, and the

time they spend doing any activity is invaluable," says Akhavan. While it may never match Little League or cartoons, TechTreK proves to many families that spending quality time together doesn't have to mean being unplugged. TechTreK: +1 (301) 881 8735.

- Mary Elizabeth Williams

Rendering Refusenik

Sitting in the swanky Paramount Hotel in Manhattan, Tom Zito pauses, spoon poised over a bowl of oatmeal. At 47, he wears his baseball cap with Spielbergian aplomb. He signs off on production budgets, shooting locations, and script rewrites. He hires directors and wrestles with the ratings board. He casts buxom starlets and *Tiger Beat* heart-

Jargon Watch

Bookmark

To take note of a person for future reference (a metaphor borrowed from Web browsers). "I bookmarked him after I saw his cool demo at Siggraph."

Dustbuster

A phone call or e-mail message you send to someone after a long silence – just to "shake the dust off" and see if the connection still works.

Encrypted English

International correspondence from someone whose command of English is well intentioned, but tenuous. "We will most please thank you for investigating our problem in your computer."

Information Dominance

Military term for having superior intelligence and the ability to cripple an enemy's information infrastructure. "In the Gulf War, the coalition clearly had information dominance. In Somalia, it was Aidid."

Jitterati

What the digital generation becomes after tanking up on too much coffee.

Netscape

Nickname for AOL's less-than-full-featured Web browser.

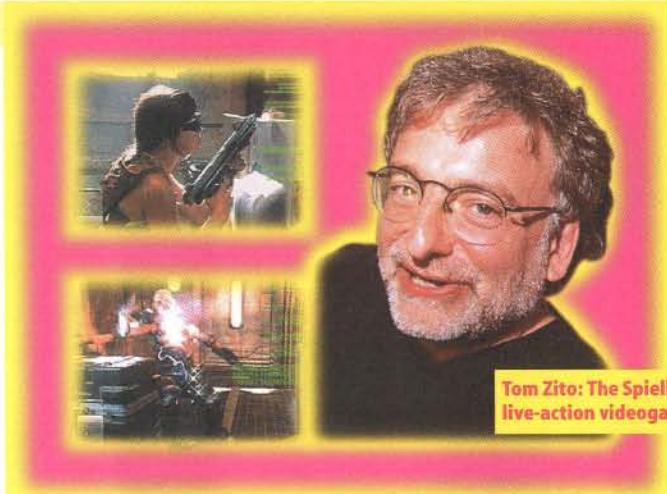
WAW (Waiter-Actor-Webmaster)

Used to describe fly-by-night graphic designers and Web consultants trying to cash in on the Web boom. "Can you believe they hired that clueless WAW for US\$60K a year?!"

Tip o' the sombrero to: J. C. Herz, Pierre Bourque, Elliot Sobel, Stewart Brand, Steve Silberman, Melchionda, Brian Maggi. — Gareth Branwyn

throbs with a self-satisfied grunt and a flurry of press releases. As president of Digital Pictures, Zito revels in the bigwig perks of a Hollywood executive producer.

Except that Zito doesn't produce films. He cranks out live-action, interactive CD-ROM videogames like *Night Trap*, *Sewer Shark*, *Supreme Warrior*, and *Corpse Killer*. Bucking the trend toward realistic, computer-rendered graphics, Zito's games are a mosaic of video footage strung together with a proprietary software code. While most game developers are working to make their graphics look more like film, Digital Pictures is



Tom Zito: The Spielberg of live-action videogames.

trying to make its video stars seem more like computer-spawned sprites. At as much as US\$2.5 million per production, Zito's betting serious bucks on the idea that videogame junkies prefer cinematic wallop to *Doom*-style navigability.

"You make sacrifices using computer-rendered graphics, and you make sacrifices using video. Zito is reminding everybody of what you can do when you make a different set of sacrifices," says Carl Goodman, who curates new media exhibits for the American Museum of the Moving Image. "It's a thankless job, because he's had to suffer the slings and arrows of hard-core gamers who thumb their noses at these full-motion videogames."

For die-hard thumb slingers, no full-motion game can match the intense interactivity of computer graphics – yet. But Zito doesn't aspire to be the messiah of the twitchy-finger contingent. He is a producer. And so he's explaining how the best game designs simulate the immersion and audience identification of the motion picture experience.

To drive the movie point home, Digital Pictures's latest releases use the eloquent body parts belonging to the likes of almost-real actors Mike Ditka, Yasmine Bleeth, Debbie Harry, and erstwhile teen idol Corey Haim.

Will this kind of marquee power sell videogames? Zito shrugs over his empty plate. "Look, this is a hip business. If the game's not good, it's not gonna fly." Which means, one hopes, that there are no *Waterworlds* in Tom Zito's digital picture. — J. C. Herz

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Exhibitionists,
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Backup – Move Ahead

Everyone should have an affordable backup system, and Iomega has answered the call – with a vengeance. The Iomega Ditto Easy 800 tape backup system has a slower data-transfer rate than a regular disk drive, but its 800-Mbyte storage capacity and low price are worth a second look. Available in an external model that connects to the parallel port of your Mac or PC, the Easy 800 can be used on multiple systems without complex installation. Along with Iomega's removable Zip and Jaz drives, the Ditto rounds out a sensible trio of low-cost storage options. **Ditto Easy 800: US\$150.**
Iomega: (800) 697 8833, on the Web at <http://www.iomega.com/>.

Tune Tunnel

The SoundTube may appear to be more at home hanging out with a string of lanterns in a Chinese New Year's parade, but it's actually best used as an omnidirectional loudspeaker system that delivers professional-quality sound. Offered in sizes from 3 feet to 10 feet, the SoundTube comes with a cover sleeve available in a variety of colors and patterns – it can even be printed with custom graphic designs. **SoundTube: US\$700 to \$1,500.** SoundTube Entertainment Systems: (800) 647 8823.



F E T I S H



Edited by David Jacobs



Surf Support

Your wrist is killing you, but you've still got four more hours of work till you're done. What to do? The folks at Ergolink have a solution. The Ergowrist is a simple device that slips behind and over your mouse to support your wrist. By placing your hand in a resting position at a 20- to 30-degree angle over the mouse, Ergowrist helps alleviate the stress that can lead to carpal tunnel syndrome as well as neck and back strain. **Ergowrist: US\$9.95.** Ergolink Inc.: +1 (604) 682 4145, fax +1 (604) 682 4104.

Goo!

While a child's formative years were once as simple as a sandbox, getting your toddler on the fast track today means a computer. But since no 3-year-old can deal with Windows 95, drop the tyke in front of the Comfy Activity Center, a playful kiddie keyboard that entertains and educates with the magic of CD-ROM. Designed for children as young as 12 months, the Activity Center includes keys that play notes and evoke colors when tots press them. It's also got a phone for ringing up ComfyLand characters. Now you can show your love for your child and still keep the PC out of the nursery. **Comfy Activity Center: US\$99.** Comfy Inc.: (800) 992 6639, +1 (408) 865 1777.



CompuNoir

If Darth Vader had been a multimedia freak, he would have owned an UPKE System 2626. The sleek casing and glare-resistant liquid-crystal display would have proved a welcome addition to the otherwise drab Death Star decor. In addition, the slim, retractable keyboard leaves the desktop free for signing Imperial execution orders. A standard-issue UPKE comes loaded with built-in TV, phone, and stereo capabilities — and more bundled Microsoft products than you can shake your light saber at. It might even leave you considering a walk on the dark side. UPKE System 2626: approximately US\$5,000.

UPKE Systems Corp.: +1 (617) 928 3035, e-mail dgranovsky@upke.com.

So Long, Wet Butts

Forget those soggy minutes spent sitting hip-deep in the snow while struggling to strap on your snowboard. The Autolock, compliments of Switch Manufacturing, is the first step-in, quick-release, soft-boot binding, and it's continually self-tightening. With the Autolock, you'll face the slopes each morning certain that you and your board will remain one while you carve out those turns. Autolock bindings: US\$179 a pair.

Switch Manufacturing: +1 (415) 777 9415.



Going Mobile

You can't take your show on the road these days without high-quality sound capabilities. Not if you expect to get any respect, that is. So if your laptop is in need, jazz up your presentations with Panasonic's mobile multimedia upgrade kit. The kit adds a portable CD-ROM drive with two battery-powered speakers and a 16-bit SCSI sound card. Panasonic even throws in ESS Audio Sound Suite software. It'll all add nearly a pound to your load, but you'll thank yourself twice the next time you're stuck in the airport and desperate for a quick game of Descent. KXL-D721 multimedia kit: US\$599. Panasonic: (800) 742 8086, +1 (201) 348 7000.

Little Box, Big Sound

Bose's Lifestyle 20 music system looks innocuous enough — but inside, it sports the world's smallest six-disc CD changer. The handsome brushed-chrome base unit also houses an AM/FM stereo tuner with 30 programmable channel settings and comes with a handy remote control. Lifestyle's Jewel Cube speakers pump out the audio in conjunction with a powerful bass module that can be hidden from prying eyes — and ears — anywhere in your home. Lifestyle 20: US\$2,400. Bose Corporation: (800) 444 2673, +1 (508) 879 7330.

F

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EntertainmentMCN

Infrared Printing

The worst thing about giving laptop presentations is printing up the materials for your audience. You don't want to print through the fax, and you'd rather not get tangled in printer cables. Well, why not go wireless? Hewlett-Packard's DeskJet 340 is the first portable printer to feature an infrared accessory kit for cable-free printing: the wireless unit can receive data from a computer located up to 3 feet away. Accessories for the 340 include batteries, color output kits, and sheet feeders. HP DeskJet 340: US\$365. Infrared kit: \$49. Color Kit: \$49. Sheet feeder: \$99. Hewlett-Packard: (800) 752 0900, +1 (415) 694 2000.

Channel Master

No mere onscreen TV listing, the VideoGuide sold by RadioShack is actually a wireless pager service for your television. VideoGuide provides full-screen program listings and lets you record to your VCR by selecting the desired program and simply hitting Enter. An optional, up-to-date online newspaper provides regional, national, and international news, sports, and weather updates from The Associated Press and United Press International wire services. VideoGuide: US\$99.99. RadioShack: (800) 843 7422, +1 (817) 390 3011.



Smart Skis

If you want to master the hill, you've got to have complete control of your skis. Barring a move to Colorado, a little high technology might be just the ticket. The K2 Four is the first ski with a built-in microprocessor. Based on the same vibration-control modules developed for F-18 jet fighters and NASA's space shuttles, the K2 Four's sensors detect trail conditions and improve the ski's stability. A piezoelectric material converts low-frequency vibration into electrical energy, which provides the juice for the smart ski circuitry to send out counter-balancing vibrations, nullifying ski jitter. K2 Four: US\$625. K2 Corporation: +1 (206) 463 3631, fax +1 (206) 463 5463.

Bang Your Head

With its patented protection system, the EZ Gard's Shock Doctor mouth guard protects against concussion, temporal-mandibular-joint disorder, tooth and jaw fractures, and oral lacerations. And if you're accidentally smacked in the face with a hockey puck, EZ Gard offers a US\$7,500 dental warranty. A little late, but it's nice that they're thinking of you. Shock Doctor: US\$19.95. EZ Gard Industries: (800) 233 6955, +1 (612) 536 3966, on the Web at <http://www.ezgard.com/>.

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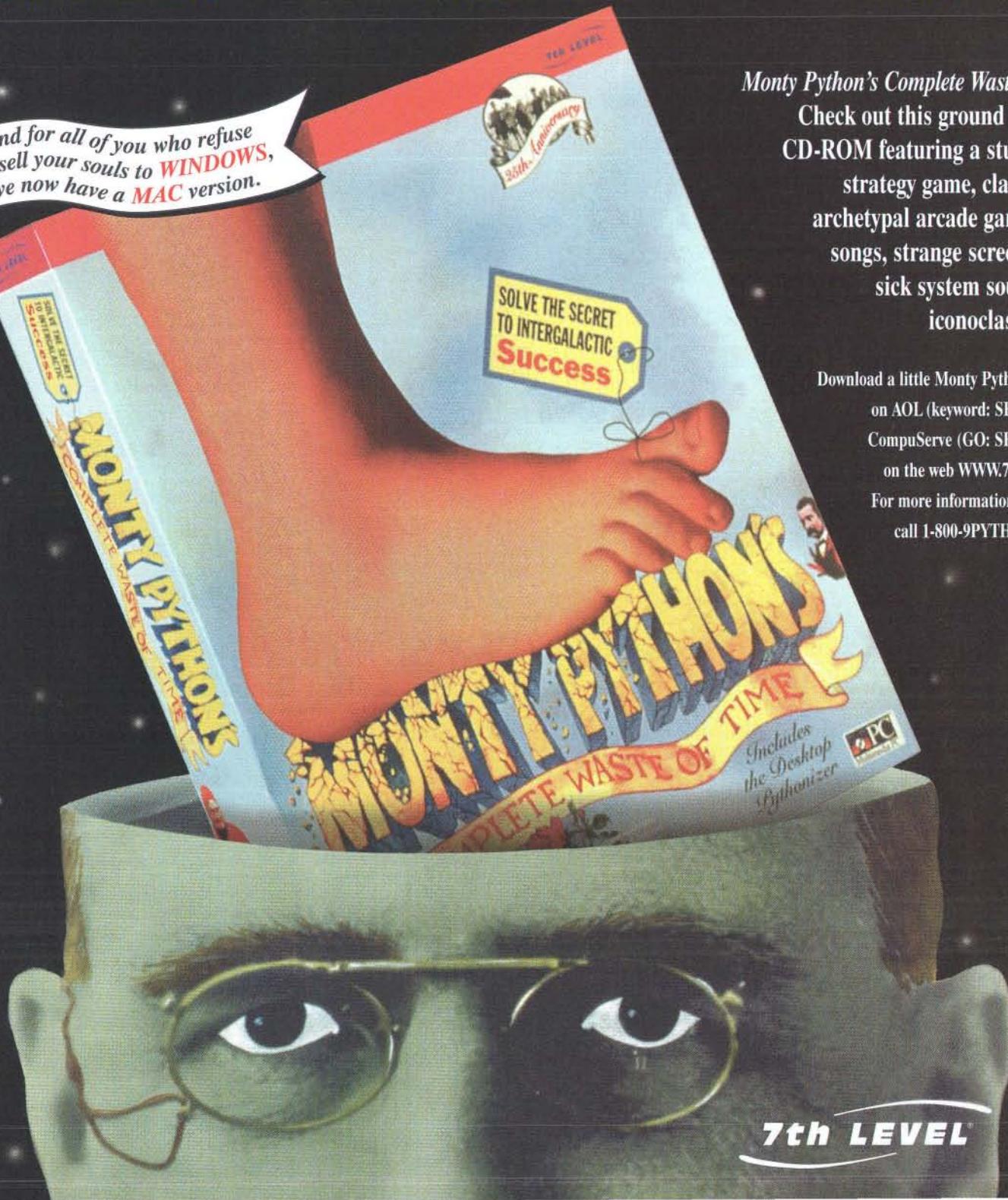
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7th LEVEL

The Future of Hemp

You've heard the hype. We asked the experts. Here's the real timetable.

For the last 40 years, anti-marijuana laws have discouraged US farmers from growing hemp. But in Canada, England, France, and other countries, industrial hemp is a prime agricultural commodity used to produce goods such as textiles, paper, and cosmetics. Moreover, through the miracle of genetic engineering, smoking the industrial hemp seed varieties

grown abroad gives you nothing more than a nasty headache. In the US, "hempsters" are studying agricultural R&D while trying to educate the public about the plant's beneficial uses. The point, they say, is to separate the rope from the dope. *Wired* asked several experts to speak bluntly about the future of industrial hemp. —David Pescovitz

	US Licensing to Grow Industrial Hemp	Retail Sale of Hemp Construction Products	Hemp-Based Auto Fuel	Hemp Clothing Sold in Department Stores
Bohling	1996	1999	1998	1996
Friedman	2001	2000	2010	1996
Hickey	1997	1998	2010	1996
Roulac	1998	1998	2008	1996
Sholts	2000	2012	2012	1999
Bottom Line	1998	2000	2008	1997

Christie Bohling
CEO, The Coalition for Hemp Awareness; a founder of the Hemp Industries Association

Ken Friedman
president, American Hemp Mercantile Incorporated

Joseph W. Hickey, Sr.
executive director, Kentucky Hemp Growers Cooperative Association Inc.

John W. Roulac
president and founder, HempTech, The Industrial Hemp Information Network; editor and publisher, *Industrial Hemp: Practical Products – Paper to Fabric to Cosmetics*

Erwin A. Sholts
director, Agricultural Development and Diversification Program, Wisconsin Department of Agriculture, Trade, and Consumer Protection

Before industrial hemp can become a major cash crop in the US, the government must lift its ban on issuing permits for large-scale hemp cultivation. Several of our experts predict that licensing legislation will be nudged along by fiber-dependent companies like International Paper and Inland Container Corporation that are beginning to investigate the benefits of hemp. Hickey predicts that commercial licensing "will most likely be accomplished by federal regulatory changes and legislation enacted on a state-by-state basis." Friedman agrees, arguing that the US Drug Enforcement Administration will not relax its anti-hemp stance until Congress or the courts force the agency to do so. Meanwhile, Bohling wryly notes that "Even corn cultivation was permitted during Prohibition."

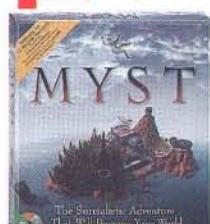
Clear-cutting has taken a toll on wood resources, so the fiber-composite industry is beginning to look seriously at hemp as a substitute raw material. Our experts predict that in the next five years, hemp-based fiberboard may be sold next to pine plywood. Roulac notes that Washington State University has already demonstrated that hemp is stronger than wood when used for fiberboard production. Bohling says European hemp-based construction products are already available in the US, but are "costly, largely because they must be imported." The price will drop after US fiberboard facilities make the easy conversion to hemp processing, but hemp supply barriers must first be overcome. Hickey anticipates this can happen within two years "if farmers organize now."

Because of hemp's heartiness as a renewable resource, all our sources agree the crop could be used as an environmentally correct ethanol-based automobile fuel. Several experts noted that some early Ford models featured hemp-composite fenders and ran on fuel derived from hemp and other plants. Nevertheless, they don't think we'll be filling our tanks with hemp fuel any time soon. "The problem lies in developing technology for making affordable plant-based fuels, not in finding a supply of raw material," Roulac says. Hickey agrees that "Because of its valuable health, beauty, and industrial applications, hemp oil will probably be directed toward these higher-profit markets at first." By the time hemp fuel is commercially viable, Friedman notes, solar-powered or electric autos may have negated demand.

In the US, many consumers believe that hemp fabric is the stuff of novelty baseball caps sold in head shops or of backpacks featured in outdoors catalogs. But overseas, the fabric is already becoming one of the hippest clothing trends in the fashion world. Hickey comments that "Foreign designer magazines are predicting that hemp will be the fabric of the future." Our experts agree that its durability and linenlike comfort will make it a common product in US department stores. In fact, Bohling points out that "In response to Calvin Klein's presentation of hemp bedding, Ralph Lauren announced that hemp has been his trade secret for 12 years!" Roulac says that Adidas will market a line of hemp sneakers during the spring.

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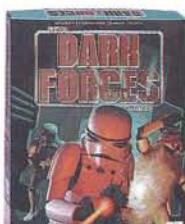
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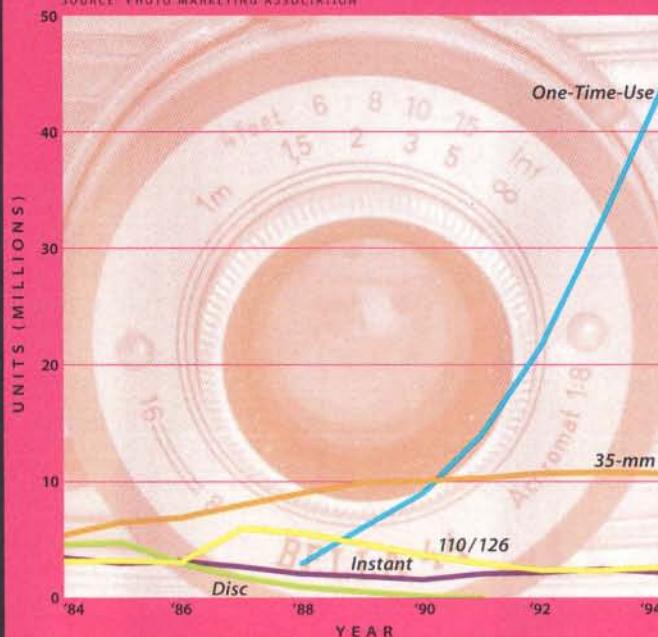
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Camera Sales

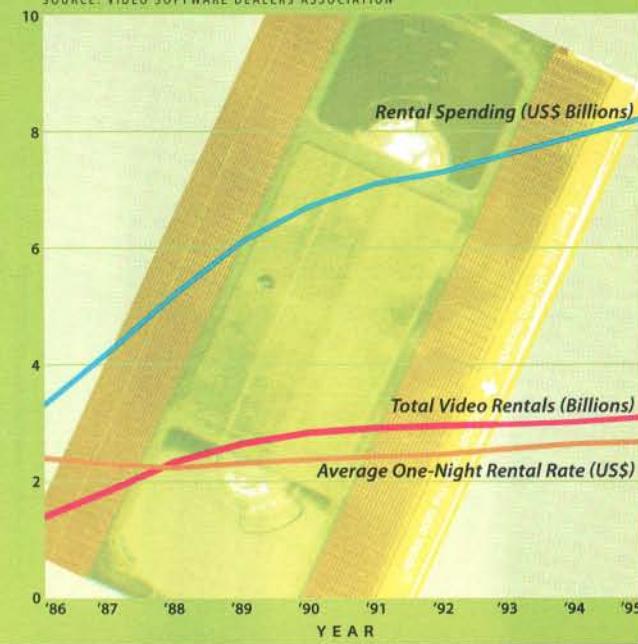
Disc cameras came and went like the burst of a flashbulb while one-time-use cameras have become a photography success. Disposable cameras are dirt cheap, and the telephoto, panoramic, and underwater models offer features normally found only on expensive 35 mms. Cameras built for a new 24-mm film standard will hit the market later this year.

SOURCE: PHOTO MARKETING ASSOCIATION

**Video Rentals**

VCRs are a fixture in 80 percent of American households, so video rentals have begun to plateau. Meanwhile, competition within the rental industry has kept rates flat. Video-on-demand may someday put your neighborhood video store out of business, but that service has been delayed by infrastructure barriers and limited consumer appeal.

SOURCE: VIDEO SOFTWARE DEALERS ASSOCIATION

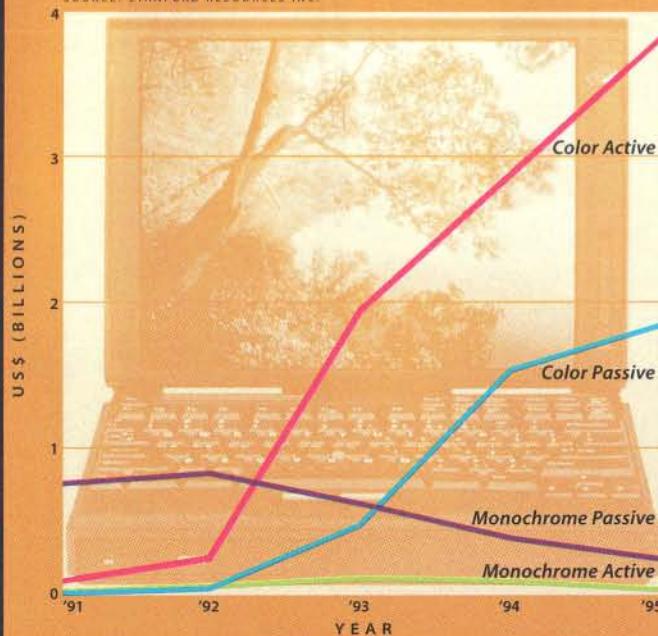


Edited by Todd Lappin

Flat-Panel Computer Display Sales

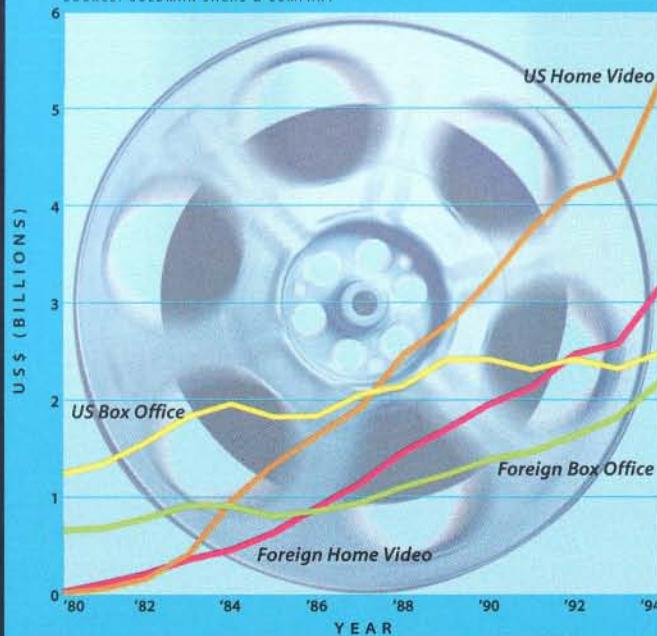
Active-matrix displays offer superior image quality, but until recently, they cost two to three times as much as passive-matrix screens. Now, with plenty of new active-matrix manufacturing capacity coming on stream, that gap has begun to close. Roughly 80 percent of laptops sold in 1995 were shipped with color screens.

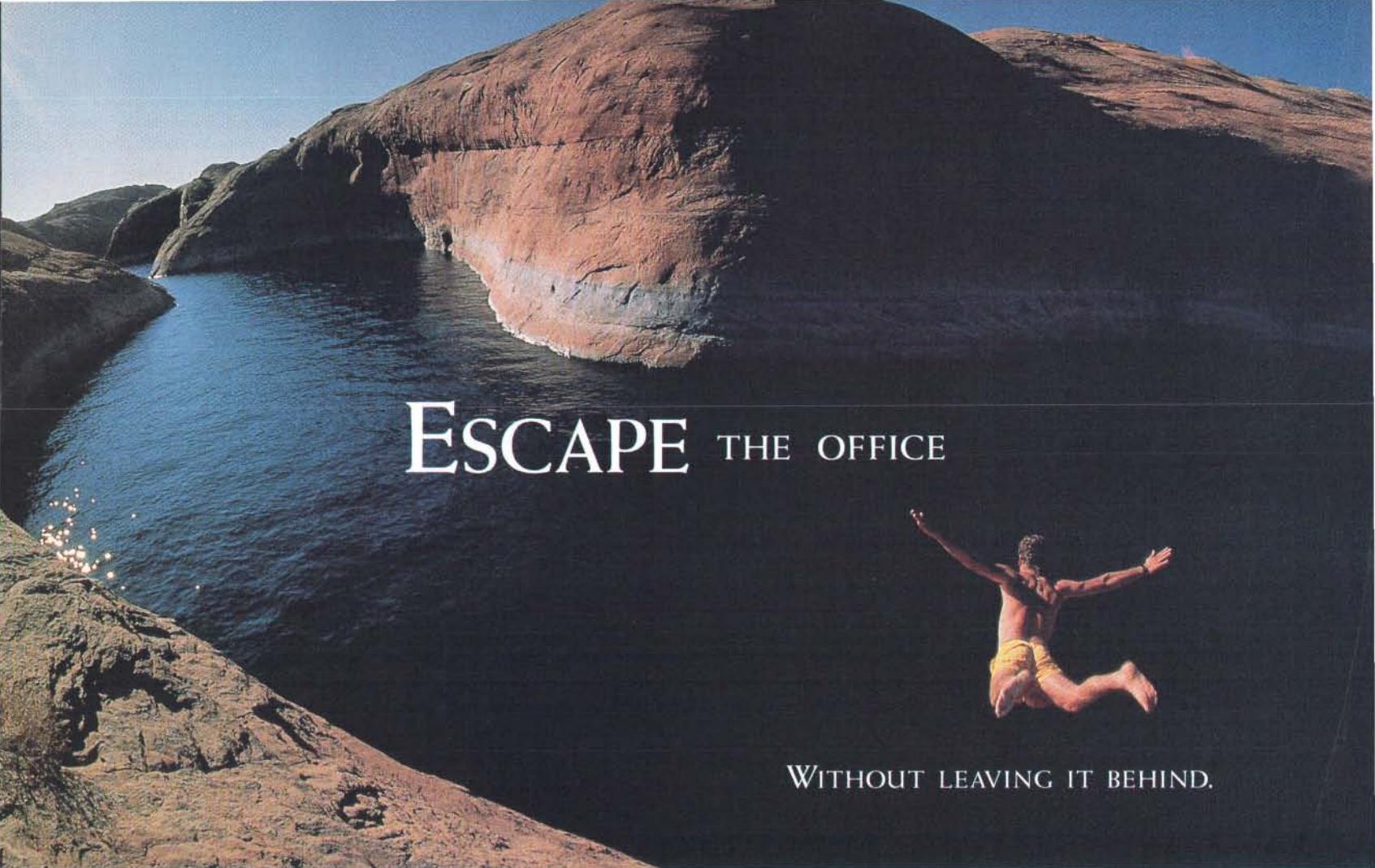
SOURCE: STANFORD RESOURCES INC.

**Motion Picture Industry Revenue**

Waterworld bombed at the box office, and Stallone hasn't had a hit in years. Why aren't Hollywood's bean counters in a panic? Largely because of revenues pouring in from home videos and the international market. In 1994, videos accounted for 49 percent of the film industry's US\$17 billion revenue while foreign revenues grew by 18 percent.

SOURCE: GOLDMAN SACHS & COMPANY





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Petaflops Computing

A fast ride in a cold machine.

One possible hybrid petaflops computer system:

By Jarrett S. Cohen

4,096 32 GHz processors and memory caches bathed in liquid helium

Optical interconnect between processors and memory

SRAM caches cooled in liquid nitrogen

Optical packet switch

DRAM memory

Photo-refractive 3-D optical memory (~10 petabytes)

Last summer, the United States Department of Energy and the Intel Corporation announced a US\$46 million agreement to build

the world's first teraflops computer, able to crunch 1 trillion floating-point operations per second. While six times faster than existing machines, a teraflops computer is still not powerful enough to adequately model important problems like Earth's climate patterns or the AIDS virus, observers say. For such applications, 1,000 times more processing power is necessary – a petaflops.

A petaflops is equal to 10 times the speed of all the networked computers in the US combined. Sound far-fetched? Scientists and engineers in a NASA-led "constructive lunatic fringe group," as participant Seymour Cray calls it, are already planning computers with this capability. No one is sure exactly how these machines will work, but they will require fundamental changes in the way computers are designed.

Intel's system reaches a teraflops by linking more than 9,000 Pentium Pro chips. A continuation of this semiconductor-based massively parallel approach is one option for reaching a petaflops. Projections show that by 2020, 40,000 chips working together would perform at that level. But this scheme would require 10 megawatts of continuous power, enough to supply a small town! The result? Instantaneous meltdown.

A way around this dilemma is to merge processing and memory onto the same piece of silicon. Processor-in-memory (PIM) chips improve performance by reducing the signal delays inherent in fetching data from memory. When you're operating at high speeds, distance really matters: light travels only one foot in a nanosecond. Approximately 10,000 future-generation PIM chips could achieve a petaflops using 12 kilowatts of electricity for processing – a more efficient performance, but still too much heat.

A more exotic alternative that still encompasses low power would be very-high-speed logic built out of superconductors. Cooled in liquid helium to 4.2 degrees Kelvin (-452 degrees Fahrenheit), cryogenic superconductors lose their electrical resistance. That means low-power operation and no fear of overheating. Superconductor logic chips are also easy to manufacture. They are usually composed of just a few layers of the superconducting element niobium, one layer of a resistive film, and two to three layers of insulation.

Of course, the idea of using superconducting chips in computers isn't new. Projects sponsored by IBM and the Japanese government during the 1970s and 1980s developed the chips by using direct current low- and high-voltage levels to represent binary information in a method that resembled the operation of semiconductors. The Japanese managed to clock a frequency of 1 GHz, but today's fastest semiconductor chips are

already reaching 300 MHz. This small speedup, therefore, does not warrant the cost of cryogenic cooling.

Konstantin Likharev, professor of physics at the State University of New York at Stony Brook, says these earlier efforts were unsuccessful because researchers tried to force superconductors to work like semiconductors. He and a group of SUNY colleagues tread a different path – rapid single-flux-quantum (RSFQ) circuits.

These circuits take advantage of the natural interaction between superconductors and magnetism. The magnetic field lines passing through a ring of superconducting material are quantized, or restricted to a finite number of values. These "flux quanta," so named because physicists characterize the field in terms of magnetic flux, can represent the 1s and 0s a computer needs to operate.

The information passes from one ring to another through Josephson junctions, aluminum-oxide tunnel barriers that separate the superconducting materials. As one flux-quantum enters or leaves a ring, a picosecond (one-trillionth of a second) pulse is generated across a junction. By passing through a converter that translates it into a voltage signal, this single-flux-quantum pulse switches subsequent circuits.

With these techniques, the signals are propagated between the logic gates at the speed of light. RSFQ chips now operate at 30 GHz, and theoretically, 300 GHz is possible. Rates like this translate into chips 100 times

faster than their semiconductor counterparts. By 2015, a petaflops computer should be attainable using 10,000 superconductor chips, each performing at 100 gigaflops.

Since superconductor circuits can work with millivolt signals, extending today's technology would result in a single chip consuming only 0.1 watts. Taking into account the extra energy required for helium cooling, advances should result in a 10,000-chip computer that consumes a total of 100 kilowatts.

Petaflops computers most likely will use some combination of these future technologies. Thomas Sterling, senior scientist at the NASA/Goddard Space Flight Center, believes a hybrid architecture will provide the best overall price performance. Semiconductors would supply random-access memory, while optics would provide mass storage and fast communication between cryogenic logic and room-temperature memory.

Leveraging mass production where possible, Sterling believes a petaflops computer will cost between \$100 and \$200 million. With the potential for widespread socioeconomic benefits, an idea that seems lunatic today begins to look like the mainstay of the early 21st century. ■ ■ ■

For more information, see <http://cesdis.gsfc.nasa.gov/petaflops/peta.html>.

Jarrett S. Cohen (jarrett.cohen@gsfc.nasa.gov) is a science writer with Hughes STX Corp.

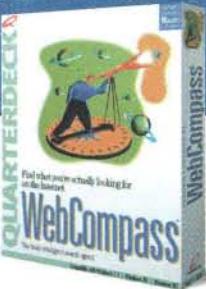


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Fear or Greed?

As I sat down to write this column, the virtual stock exchange floor bell had just rung, concluding Pixar's first day of trading as a public company. The stock opened at a roaring

By Anthony B. Perkins US\$46 per

share (up 109 percent from the initial public offering price of \$22), traded as high as \$49.50, and landed at \$39 by the end of the day. This price per share gives Pixar (510/236 4000) a

\$1.5 billion. Yes, timing Pixar's IPO on the heels of the premiere of its blockbuster movie, *Toy Story*, was brilliant. And, yes, there will be CD-ROM titles to make and character licensing agreements to sign. And, yes, Pixar has signed a three-movie deal with Disney, the most powerful entertainment company in the world. But let's face it, unlike Netscape, Pixar isn't selling into a market that promises to reach \$25 billion by 2000.

Other Wall Street analysts told me off the record that many growth-fund managers have been buying at the IPO, running stocks up, and later dumping them to boost their own results before the year's end.

The key question for investors right now is when to sell. (Investors don't want to be left holding stock when the market ultimately corrects itself or – even worse – takes a huge dive.) My answer? The sooner the better. When a market is as ridiculously hyped as this one, where tiny little companies are breaking trading-volume records, it's only going to take one sharp prick of bad news to burst the bubble. Let me give you an example.

The most closely watched, overhyped stock right now is Netscape. My bet is that two major events before March 1 will cause the company's stock to suffer a major hit. The first big challenge is Explorer, Microsoft's entry into the Web browser market. Microsoft has agreed to license Sun's Java and incorporate it with Explorer, boosting that browser's chances for market acceptance. I asked Steve Jobs who he thought would win this war – he guessed Bill Gates and Microsoft. "I hate to say it, but they have a lot more resources, and they have a certain track record of succeeding at these kinds of things."

Netscape wunderkind Marc Andreessen pointed out, however, that Netscape enjoys a big advantage right now, because it has close to 12 million customers already using Navigator. "The rules of the game have changed," says Andreessen. "It used to be that to dominate, you had to control the software business. Today, you have to open up your work and contribute it to the industry." But with Microsoft apparently

adapting to this business model, it puts more pressure on Netscape to turn up the flame and remain a step ahead of the market.

The second major event for Netscape concerns the lockup period for Netscape's board of directors and top executives, who collectively are sitting on top of slightly more than 22 million shares of the company's stock. Those people will be able to unload their shares in mid-February, and while I strongly doubt these investors will be dumping all their shares, they will get rid of enough to cover their initial bets, plus show a pretty handsome profit. This action will undoubtedly drive Netscape's stock down, and it may be just the thing to let the hot air out of an inflated technology market.

I'll be going short this month on 2,500 Netscape shares so I can cash in on this inevitable downturn.

A sharp drop in Netscape could very easily turn the entire technology market back upon itself. Netscape and Pixar aren't the only tech companies whose stock may be dangerously inflated. While some might like to think this indicates investors' willingness to invest in the future of promising companies, the truth is, it's a crapshoot. People want to buy a gold mine cheap, without getting their hands dirty doing any of the digging. When it turns out that everyone who bought a share of Netscape at \$75 now owns a piece of a very expensive hole in the ground, there are going to be a lot of aggressive fund managers out there wondering just where their profits went. ■ ■ ■

The Wired Interactive Technology Fund (TWIT\$)

Company	Primary Business	Symbol	Shares	Price Dec 1	Δ Since Nov 1	Action
Mobile Telecommunications Technologies Corp.	Mobile computing	MTEL	9,700	22 1/2	- 6 1/2	hold
Netcom Online Communications Service Inc.	Internet provider	NETC	15,000	70	+ 6 1/2	hold short
Global Village Communications Inc.	Communications hw/sw	GVIL	3,800	24 1/2	+ 7 1/2	hold
General Magic Inc.	PDA sw	GMGC	4,500	13 1/2	- 1/2	hold short
Sun Microsystems Inc.	Hw/sw	SUNW	7,300	84 1/2	+ 8	hold
3Com Corporation	Networking	COMS	3,800	42 1/2	- 5 1/2	hold
LSI Logic Corporation	Semiconductors	LSI	7,800	40 1/2	- 5 1/2	hold
Applied Materials Inc.	Semiconductor equip.	AMAT	4,000	47	- 2 1/2	hold
The Walt Disney Company	Entertainment	DIS	1,500	61 1/2	+ 3 1/2	hold
Apple Computer Inc.	Hw/sw	AAPL	4,800	37 1/2	+ 1	hold
New Stocks						
Netscape Communications Inc.	Internet sw	NSCP	2,500	137 1/2		short
Portfolio Value	\$1,219,868.75			(+21.99% overall)		- 9.82%

Legend: This fund started with US\$1 million on December 1, 1994. We are trading on a monthly basis, so profits and losses will be reflected monthly, with profits reinvested in the fund or in new stocks.

Information provided here is based on a combination of insights and gossip overheard at the *Toy Story* premiere at the Cadillac Showroom in San Francisco, hanging out in the Accel Partners sky box at the Niners-Rams game, and having breakfast at Bucks in Woodside, California. The TWITS fund is a model established by *Wired*, not an official traded portfolio. *Wired* readers who use this information for investment decisions do so at their own risk.

whopping \$1.5 billion market capitalization. It also leaves the company's primary owner, Apple co-founder Steve Jobs, a net profit on paper of more than \$1 billion. (Jobs has invested close to \$60 million in Pixar over the last 10 years and retained 80 percent of the company's stock after the IPO.) The 6.9 million share offering, led by Robertson Stephens & Co., traded 11.7 million shares throughout the day, making it the second most active IPO in Nasdaq history – right behind Wall Street darling Netscape Communications.

While this is great for Pixar, it leaves me puzzled. There is no rational reason a \$5 million-a-year animation studio is worth

The method behind this madness, of course, is much bigger than Pixar, or even Netscape. Mark Douglass, vice president of Morgan Stanley in San Francisco, offers two reasons for the frothy conditions of the current IPO market. First, the Internet is blowing major gusts of wind into the sails of the technology industry. "Anticipation for the Internet and the World Wide Web remain very high in the market right now," says Douglass. He also notes that many people are succumbing to the herd mentality. "There are a lot of private and corporate investors jumping into the technology market who have never traded stocks before, because they don't want to be left out."

Anthony B. Perkins (tony@herring.com) is editor and publisher of The Red Herring (<http://www.herring.com>), a monthly investment magazine.

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Infocommer's Info

Babylon. Or so the Soviets codenamed San Francisco during the Cold War. These days, Russia's top programmers are writing code – the software kind – for companies in Babylon ... er ... the Bay area. The *teknari* add one new pattern to the cultural quilt of this cosmopolitan city, a place colored by the ancient traditions of the Far East, the vibrant spirit of Latin America, the high-bandwidth energy of Silicon Valley, and the mellow remnants of the '60s.

Explore the city patch by patch, beginning in Chinatown at the **Imperial Tea Court**, the best fully immersive virtual experience in the city. In this traditional teahouse, sip a jasmine pearl brew as you're lulled by a chorus of street traffic and a trio of finches. Though everyone loves the scallion pancakes at the nearby **House of Nanking**, this neigh-

that start up the starter-uppers. You can almost see the Eiffel Tower from your sidewalk table as you cradle an *au lait* at **South Park Cafe**. **Fringale**, a bistro on Fourth Street and Brannan, has taken this city of fog by storm. And whether you're in the mood for a micro-brew or a martini, the back-alley industrial **330 Ritch Street** is a slick spot to commune post-conference.

Skip the trip to Napa Valley – the fantastical **Hayes and Vine Wine Bar** will leave you tickled pink with its selection of oakys reds, buttery whites, and otherwise grapey spirits. Serious brewhounds might want to saunter down to **Suppenküche**, a German *Wirtshaus* serving the best wurst in town, not to mention Gigapints of ales and lagers.

Discuss asynchronous transfer à la mode at **Pure T Ice Cream and Tea Salon**, on

MARCH 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 APRIL 1 2 3 4 5 6 7 8 9 10

borhood isn't the only source of excellent Mandarin cuisine – there's also the Richmond, the nontourist's Chinatown. On Clement Street, wrap some mu shu at the **Fountain Court** or sample the corn cakes at **Marnee Thai** – both toothsome treats.

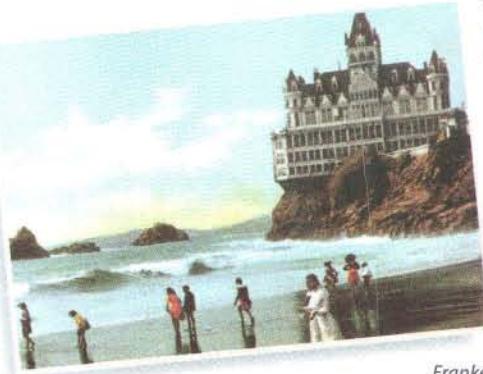
Refresh your brain between tutorials in SoMa, the area south of Market Street. Abandoned warehouses and dirt-cheap rents have attracted untold numbers of multimedia ventures and artists' studios, not to mention a handful of trendy restaurants and cafés

Russian Hill, where the scoops are flavored with tea infusions – we recommend the Earl Grey served with a sunflower cookie. But to put modern technology in perspective, visit the walk-through **Camera Obscura** behind the ultratouristy Cliff House. Here at the Pacific's edge, discover the cutting edge of yesteryear: a dark box with a small aperture in one side that dates back to the 15th century.

Then, high-tail it to the **Top of the Mark** on Nob Hill. From this elegant nest in the Mark Hopkins Hotel, observe the splendor of this bayside city, the lush green hills of Marin, the grand sweep of the Golden Gate Bridge as it rises above the fog – as much a wonder as the Hanging Gardens. A modern Babylon indeed.

– Jessie Scanlon

Tip o' the Giants cap to Jeff Wardell, Alex Frankel, and Steven Overman.



The Current Roundup (see Wired 4.01)

February 12-14 MicroNeuro 96, Fifth International Conference on Microelectronics for Neural Networks and Fuzzy Systems; Lausanne, Switzerland.

February 12-19 The American International Toy Fair; New York. • **February 21-23** Imagina'96; Monte Carlo. • **February 21-24** Tedsell; Monterey, California. • **March 9-12** South by Southwest Multimedia Festival; Austin, Texas.

March 17-20 **PC Forum; Tucson, Arizona** A subscription to *Release 1.0* has its privileges, like the right to attend PC Forum, the annual schmooze gala organized by EDventure Holdings and *Release 1.0* editor Esther Dyson. Here the digital élite will meld minds, rub shoulders, and focus on this year's theme: The Future Now (Some Assembly Required). Registration: US\$2,900. Contact: +1 (212) 924 8800, e-mail daphne@edventure.com.

March 24-28 **IEEE Infocom '96; San Francisco** ATM, gigabit networks, multicast and broadcast algorithms – name a topic and there's a technical session, panel, or tutorial on it at the Conference on Computer Communications, sponsored by the Institute of Electrical and Electronics Engineers. Keynote Arno Penzias and other electrifying speakers will illuminate you on all aspects of advanced communications technologies. Registration: US\$530, students \$140; tutorials extra. Contact: +1 (202) 371 1013, on the Web at <http://ortega.cs.ucdavis.edu/~infocom/infocom.html>.

March 25-27 **iEC Internet & Electronic Commerce Strategy Conference and Exposition; New York** This first-time event is geared toward high-level suits whose heads are spinning with questions about how to adapt their business structures and models to the information age. Browse the exhibit hall, attend seminars, and hear the keynote address by the sharpest soft guy around – Bill Gates. Access to the exposition is free if you

pre-register through February 23, or US\$50 at the door. Conference seminars extra. Contact: +1 (203) 256 4700, fax +1 (203) 256 4730.

March 27-30 **Computers, Freedom, and Privacy; Cambridge, Massachusetts** In its sixth year, the annual CFP conference is hotter than ever. The feverish spread of computer technology and the growth of networks have given us new freedom to communicate and access information, but new technologies also threaten personal privacy and provide new tools to cybercrooks and cybercops. Advocates from the computer industry, the legal profession, and government discuss this gray area of ether. Contact: +1 (617) 253 1700, fax +1 (617) 253 7002, e-mail cfp96-info@mit.edu.

March 29 **First International Virtual Conference on Mad Science; London** Finally, an international forum for the serious discussion of such pseudoscientific topics as creating life, necromancy, and supernatural intelligences. It's mad, kooky, bizarre, inane, and it's just a mouseclick away. No airfare needed. Contact: +44 (171) 815 7442, fax +44 (171) 815 7499, on the Web at <http://www.scism.sbu.ac.uk/cios/paul/MadScience/>.

Out on the Range

April 14-18 CHI '96; Vancouver, Canada. Contact: +1 (410) 263 5382, e-mail chi96-office@acm.org. • **April 18-20** Conference on Technological Assaults on Privacy; Rochester, New York. Contact: +1 (716) 475 6643, fax +1 (716) 475 7120, e-mail privacy@rit.edu. • **April 22-23** PAAM'96 – The First International Conference and Exhibition on the Practical Application of Intelligent Agents and Multi-Agent Technology; London. Contact: +44 (1253) 358081, fax +44 (1253) 353811, e-mail agents@pap.com.

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A Change Is Coming

Apple Daily, Jimmy Lai's latest publication, has taken Hong Kong by storm, rising to Number One in newsstand sales in its first four months. Already publishing several highly successful print vehicles (*Next*, *Easy Finder*, *Sudden Weekly*), Lai launched *Apple* with US\$100 million in personal funds. An indigenous newspaper published in Chinese, with an unprecedented 12 pages of consumer information, *Apple* is independent of any institutional or political influence.

"Hong Kong will hold China to the fire of world opinion," says Lai, who has faith that, after 1997, China will be forced into the current of free-flowing information — and will be held accountable by it.

"Information will mean political control," Lai continues. "That will make Hong Kong very important to the future of China." It also puts Lai in the catbird seat.

[ORIGINAL STORY IN WIRED 2.12, PAGE 82.]



Native Nets

Melding traditional and modern, ATIIN — the Advanced Tribal Integrated Information Network Inc. — has established the first fully Native hub on the Web. Since its debut last June, Native CyberTrade (<http://www.atiin.com/cybertrade/>) has blossomed.

Based in Albuquerque, New Mexico, ATIIN seeks to evaluate, educate, and wire Native establishments and individuals, ultimately allowing them to maintain a self-sufficient online presence.

"The hardest part is educating the Native American community on the technology's potential," explains principal Evans Craig, a Shiprock, New Mexico, Navajo who holds a master's in distance education. But early adopters like silversmith Kenneth Johnson are seeing the light and, with Craig, are taking this message to the people, enriching the Web in the process.

[ORIGINAL STORY IN WIRED 3.12, PAGE 108.]

Home Is Where the LON Is

Home may be where the heart is, says Echelon Corporation CEO Ken Oshman, but "the digital home is going to be a killer app." In 1991, Echelon used its LonWorks neuron chips to create "smart" dimmer switches for lighting homes. Five years and more than a million LonWorks control nodes later, Echelon has moved out of the home and into the street, applying intuitive control systems to citywide electric grids while also battling provisions of the House Telecommunications Reform Act of 1995.

In several US communities, Echelon's LON (local operating network) technology already allows customers to control various utilities. Echelon estimates 70,000 homes will be automated via LonWorks systems by the end of 1996 — a feasible prediction, as IntelliNet, a home builder in Florida, plans to construct 12,000 LonWorks-automated homes this year and more in the future. Echelon hopes to oversee the installation of more than 10 million nodes by the millennium, fulfilling its self-stated goal of "taking networking beyond the computer."

When chip prices declined in the 1980s, embedded-systems manufacturers flourished. Neuron chips produced by Toshiba and Motorola now cost roughly US\$4 each, down from \$15 in 1991. As a result, the chips are being used in a wide range of applications, including many LonWorks smart systems. The "plug-and-play interoperability" of these products is critical to Echelon's future success.

Approximately 2,000 companies worldwide are developing products based on LonWorks technology, recognized as an open standard for such networking devices as electric meters, motion detectors, and television sets. Echelon's LonMark Interoperability Association, founded in May 1994 and sponsored by the likes of Microsoft, Honey-

well, and Motorola, better enables Echelon to sell its smart wares. Under these standards, IBM has introduced Arigo, a PC-based system that allows users to control the operation of home devices over existing power lines.

However, Echelon is smack in the middle of a power struggle on this home front. While TVs fight with PCs for control of domestic automation, Echelon and 13 other Silicon Valley companies, calling themselves The Coalition to Preserve Competition and Open Markets, contend that HR 1555 — the telecom reform legislation passed in August 1995 — limits competition. Supporting the Eshoo Provision, Section 202 (1) of the act, the coalition stood firm against the imposition of "premature" standards for computerized homes.

HR 1555 mandates specific technological standards for set-top cable boxes. As Echelon sees it, this favors the firm's longtime rival Consumer Electronics Bus. The coalition posits that mandating technological standards for TVs will only help establish the tube as central command in an automated home. For its part, Echelon has placed its heart, and its bets, on the PC. — Alex Frankel

[ORIGINAL STORY IN WIRED 1.1, PAGE 38.]

Intellidata Ain't Too Smart

The battle for privacy is fought on many fronts. Just ask the citizens of St. Louis, who recently grappled with local businesses on the virtual steps of Southwestern Bell. The dispute: Caller Intellidata, a newly proposed business service that would have given subscribers the name of each caller, along with the individual's address, phone number, and "community profile." Bell's Caller

ID capability, linked with the databases of Equifax Inc., raised "serious public policy concerns" with the Missouri Public Service Commission.

Bell withdrew the proposal in October, but will resubmit it by late 1996. According to Terry Freeman, product manager for Southwestern Bell, any future service will be amended to provide businesses with the original six reports (breakouts of calls received by the hour,

day, date, et cetera) without the offending "customer detail" sheet. "The service in no way compromises any consumer privacy issues," Freeman states.

Even so, state Public Counsel Martha Hogerty is keeping a close eye on the Bell. "We've got a real concern," she says, "that this kind of service could have a chilling effect on people's willingness to use the network."

[ORIGINAL STORY IN WIRED 3.09, PAGE 96.]

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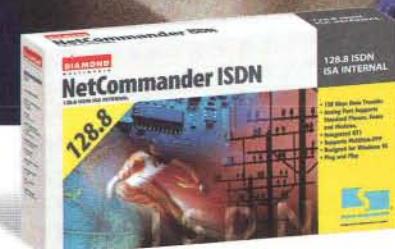
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Surveillance-on-Demand

The FBI wiretap plan is a symptom. The disease is called the Communications Assistance for Law Enforcement Act.

Power-hungry thought police are demolishing our freedom and privacy. Under threat of US\$10,000-per-day penalties, US phone companies are being forced to install wiretap surveillance circuits throughout the nation's communications networks at a cost to taxpay-

By Jim Warren ers of at least \$500 million. This national wiretap system is mandated by HR 4922, the Communications Assistance for Law Enforcement Act, a miserable piece of legislation co-authored in 1994 by Senator Patrick Leahy (D-Vermont) and now-retired Representative Don Edwards (D-California).

With FBI Director Louis Freeh leading the charge, the Clinton administration lobbied hard for HR 4922, and Democrats rammed it through Congress in less than two months – without substantive hearings. The bill was passed without debate, by voice vote in the House and unanimous consent in the Senate – only minutes before Congress

adjourned for reelection season in October 1994.

Freeh suckered our technologically illiterate Congress by pleading that new telecommunications technology has endangered government's ability to conduct lawful wiretaps and by claiming that law enforcement was merely seeking to maintain current surveillance capabilities.

But the Communications Assistance for Law Enforcement Act massively expands government's wiretap power. It mandates the installation of undetectable circuits for eavesdropping on wired and wireless voice and data communications from remote surveillance offices located anywhere in the nation.

The Communications Assistance for Law Enforcement Act made its presence felt recently after it was learned that the FBI has demanded – with Clinton administration backing and under the auspices of the act's surveillance provisions – enough wiretap circuits to simultaneously eavesdrop on at least one call per 100 in various urban regions, and one call per 400 in low-crime communities,

"pursuant to a court order or other lawful authorization." The FBI states that such simultaneous capacity is "required to accommodate all [wiretaps] that the Attorney General estimates" will be needed by October 1998.

Never mind that The New York Times reports "fewer than 850 court-authorized wiretaps" have been conducted annually in recent years. The Clinton administration wants to spy on millions more citizens than government ever has before. Either it's bracing for a monumental crime wave or much of the Attorney General's expanded surveillance activity will take place under

the auspices of "other lawful authorization."

What other authorizations are there? We don't know; we know is that the new surveillance system will be available to every enforcer from local cops and zealous prosecutors to the Internal Revenue Service and the seizure-happy Drug Enforcement Agency.

All of this wiretap excess stems from the 1994 Communications Assistance for Law Enforcement Act. Congress should amend the act to restore some degree of balance between enforcers' convenience and citizens' privacy. We need better oversight of our overseers. But speak up now ... while you still dare. ■■■

On September 18, the National Science Foundation and its private sector contractor, Network Solutions Inc., announced that effective

By Stephen Pizzo immediately, all Internet domain name registrations better arrive with a US\$50 check attached. With that decision, InterNic, the Internet's official domain name registry run by Network Solutions, instantly became a self-funding, private enterprise. Finally, the last vestige

gence agencies.

SAIC's board of directors reads like a who's who of government spookery: former NSA chief and deputy director of the CIA Bobby Inman and former Nixon Defense Secretary Melvin Laird sit on SAIC's board. In addition, there's retired general Max Thurman, who commanded US troops during the invasion of Panama; Don Hicks, a former head

Jim Warren (jwarren@well.com) is a technology policy columnist.

level .com, .org, .net, and .edu domains and hand them over as a public trust to a group such as the Internet Society. Then leave SAIC to maintain the .gov and .mil domains.

Spies at the Gate
An all-star cast of shady characters now controls the Net's domain name system.

of R&D for the Pentagon; and Don Kerr, former head of the Los Alamos National Laboratory. Until recently, the board also included former CIA Director Robert Gates, current CIA Director John Deutch, and current Defense Secretary William Perry.

SAIC bristles at the implication that the InterNic contract is a Trojan horse for Net surveillance. But to remove all doubt, the National Science Foundation should reclaim the top-

In fact, they might consider creating a new top-level domain just for government contractors – .pork comes to mind. ■■■

Stephen Pizzo (stevep@ora.com) is a senior editor at Web Review magazine.

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Advertising Webonomics 101

ELECTROSPHERE
ADVERTISING ON THE WEB MAKES ECONOMIC SENSE

Not someday,

today – advertising on the Web makes economic sense.

You just have to forget everything you ever learned about the business.

By Evan I. Schwartz

New sites on the World Wide Web are cropping up at the rate of one per minute. As it expands at this astounding rate, the Web's colorful entanglement of words, pictures, sound, and motion is briskly becoming more than just a new medium. It's more like a parallel universe that mirrors the real world in some ways but exhibits unique properties in others.

And if you hang out there long enough, you will slowly discover that nothing less than an entirely new publishing and advertising economy is taking shape in this man-made, information-based terrain. Call it Webonomics.

The principles of Webonomics derive from the millions of interactions and transactions that take place on the Web every hour. And to comprehend exactly how the world's first large-scale, bit-based economy is going to play out, you have to first understand the

motivations behind the four main groups settling this digital landscape:

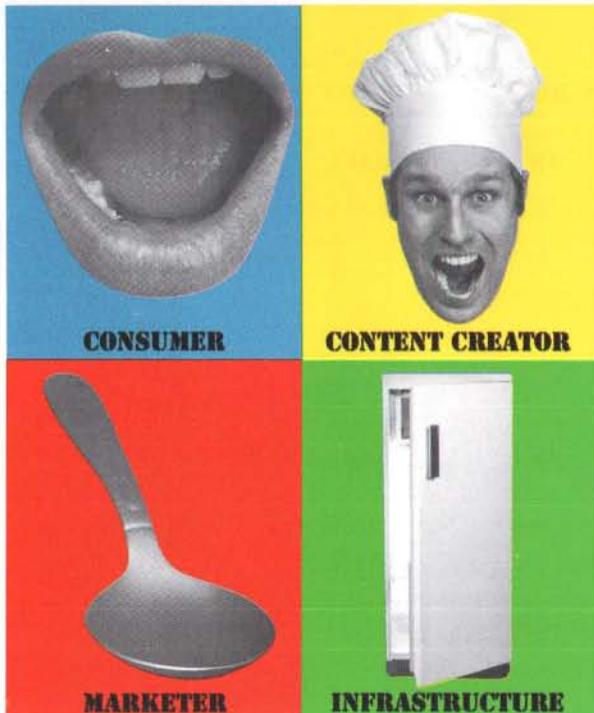
- The consumers – an estimated 20 million people worldwide, are surfing the Web in search of surprises, cheap thrills, knowledge, and entertainment, plus information on products and services they hope will enhance their lives.
- The content creators – dozens, soon to be hundreds, of publishing companies, television networks, movie studios, and hybrid media outlets are colonizing the Web by creating perpetually updated pages meant to inform and amuse those who visit.
- The marketers – hundreds, soon to be thousands, of companies are promoting products ranging from food and beverages to cars and trucks to information and financial services.

■ The infrastructure companies – makers of hardware and software are selling Web server computers and Web browser software. Dozens of Internet access providers offer gateways to the Web. And advertising agencies along with thousands of consultants have set up practices to create custom Web sites for clients.

This last group is already making money hand over fist. But that won't continue if the others decide that the Web isn't living up to its hype, which could cause newly developing business models to collapse like a house of cards. Averting such an apocalypse requires a keen understanding of Webonomics.

One of the first content creators to learn the principles of Webonomics the hard way was *USA Today*. In April 1995, the national newspaper published by Gannett Co. Inc. announced it would begin providing software for people to access its Web site, charging US\$12.95 per month for three hours of access to its online newspaper, \$2.50 for every hour beyond that. But after four months, it managed to attract only about 1,000 subscribers, a disastrous showing for a newspaper with a daily print circulation topping 2 million. Lorraine Cichowski, vice president and general manager of the *USA Today* Information Network, says the paper's first mistake was the "unnecessary" move into the Internet access business, a commodity market well served by dozens of other companies. The second mistake was charging a subscription fee. In August 1995, *USA Today* began phasing out its software business and made its Web site free.

That's the first principle of Webonomics: Consumers will rarely pay a subscription fee for access to a Web site. "In an online world flooded with free information, users will treat information charges as damage, and route around them," says Josh Bernoff, a senior analyst with Forrester Research Inc. In this sense, the Web is like cable TV: people will pay for delivery of the medium itself, but will pay extra for only one or two premium channels, if any. Which begs the question: How will content providers make their money? *USA Today*, for instance, must support more than 75 employees dedicated to running its Web site, plus a network of more than 225 freelance stringers filing special reports on hot online topics such as college football. Like everything else,



An estimated 20 million people are cruising the Web. If they decide it's not living up to the hype, developing business models could collapse like a house of cards.

motivations behind the four main groups settling this digital landscape:

- The consumers – an estimated 20 million people worldwide, are surfing the Web in search of surprises, cheap thrills, knowledge, and entertainment, plus information on products and services they hope will enhance their lives.
- The content creators – dozens, soon to be hundreds, of publishing companies, television networks, movie studios, and hybrid media outlets are colonizing the Web by creating perpetually updated pages meant to inform and amuse those who visit.
- The marketers – hundreds, soon to be thousands, of companies are promoting products ranging from food and beverages to cars and trucks to information and financial services.



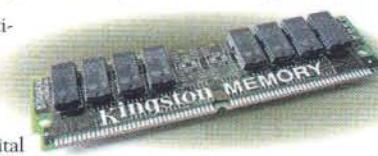
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Cichowski says, Gannett is in this to make a profit - at least eventually.

Publishers are hoping that Web users one day will prove willing to cough up "micropayments" to buy stories by the piece: a dime for an article about yesterday's Giants game, for instance. But the concept is unproven, and systems to support micropayments are in the infant stage. So, for now, says Adam Schoenfeld, a senior analyst with Jupiter Communications in New York, publishers are turning to three sources for revenue - "advertising, advertising, advertising."

The most popular Web sites, such as *HotWired*, Time Warner's *Pathfinder*, *ESPN SportsZone*, and *Playboy*'s site, have all been charging between \$30,000 and \$100,000 for three-month placement of a postage-stamp- or business-card-sized button on their digital pages. These ads are also known as "links." Click on one and your eyes will be transported, or linked, to a promotional Web site running on some other computer. After interacting with that advertisement, you presumably will link right back to where you were.

The people running these popular content sites will tell you that demand for advertising links has been strong. Bruce Judson, general manager of Time Inc. New Media, reports that at least 35 major marketers - including AT&T, MCI, Intel, Chrysler, Ford, Fidelity, and Kodak - booked for at least one quarter of 1995.

the Web than meets the eye. Talk to marketers, and they will tell you a little secret: they rarely, if ever, pay the prices published on the rate cards. "There are rates, but nobody pays the official figure," says Mary Lou Floyd, general manager for AT&T's promotional Web site. "The rates can be terribly unrealistic, so you go in and do heavy negotiating." Some marketers say they won't fork over any cash at all. Rich Everett, manager of interactive communications for Chrysler Corporation, usually demands a few freebies before he commits to paying. "If you want our business, you're going to have to give us a few free rides on the bus first," he says.

A few content sites admit to giving out Web links. Eileen Kent, vice president of *Playboy*'s New Media division, says that *Playboy*'s ad sales staff includes Web links as part of a package for the print magazine's advertisers. "Anyone who tells you they are doing significant business on the Web is lying," Kent declares. Suffice it to say that many content sites with lots of ads are not generating nearly as much revenue as they would lead you to believe.

That brings us to the second principle of Webconomics: The old models of selling advertising do not apply. Says Chrysler's Everett, "On the Web, everything we knew about advertising is out the window." AT&T's Floyd agrees: "You must throw out all traditional thinking and start from scratch." Traditionally, advertising price is

audience. So far, according to Forrester Research, popular Web sites are officially charging about \$75, even though few advertisers are paying that price. But a new model is beginning to emerge. And it's much more intricate than anyone ever imagined. To understand it, you must first consider the objectives and experiences of the marketers themselves. Every marketer has specific goals for a Web site, but there are two common themes: to enhance the brand image of the company, and to provide a targeted set of consumers with plenty of product information in the hope of landing sales and attracting loyal customers.

Volvo Cars of North America Inc. had these objectives in mind back in the fall of 1994. That's when the US arm of the Swedish automaker became the first car company to establish a Web presence, and one of the first advertisers on Web publishing sites. Specifically, Volvo wanted to give people looking for a luxury car a new information tool that would make them consider a Volvo more seriously, says Bob Austin, Volvo's director of marketing communications. He notes that only about 6 percent of the adult population has the money and inclination to buy a \$30,000 car. He saw those people as having a high overlap with the early Web surfers. "We know that our potential buyers are well-off and tend to be early adopters - people who enjoy technology," Austin says. So the company spent about \$100,000 developing and advertising what started out as essentially just an electronic brochure.

While the site failed to secure many, if any, sales, other unexpected problems arose. The only truly interactive part of the site was the ability to send e-mail to Volvo. "People would occasionally write things like: 'Nice Web site, but the sunroof on my 850 leaks,'" Austin says. Many state lemon laws require responses to such complaints within a specified time, otherwise the manufacturer has to buy back the car. Since Volvo failed to staff the site with people qualified to respond to such complaints, it became a tool not to increase sales but to potentially damage them. As a result, the e-mail feature had to be shut down within a few weeks.

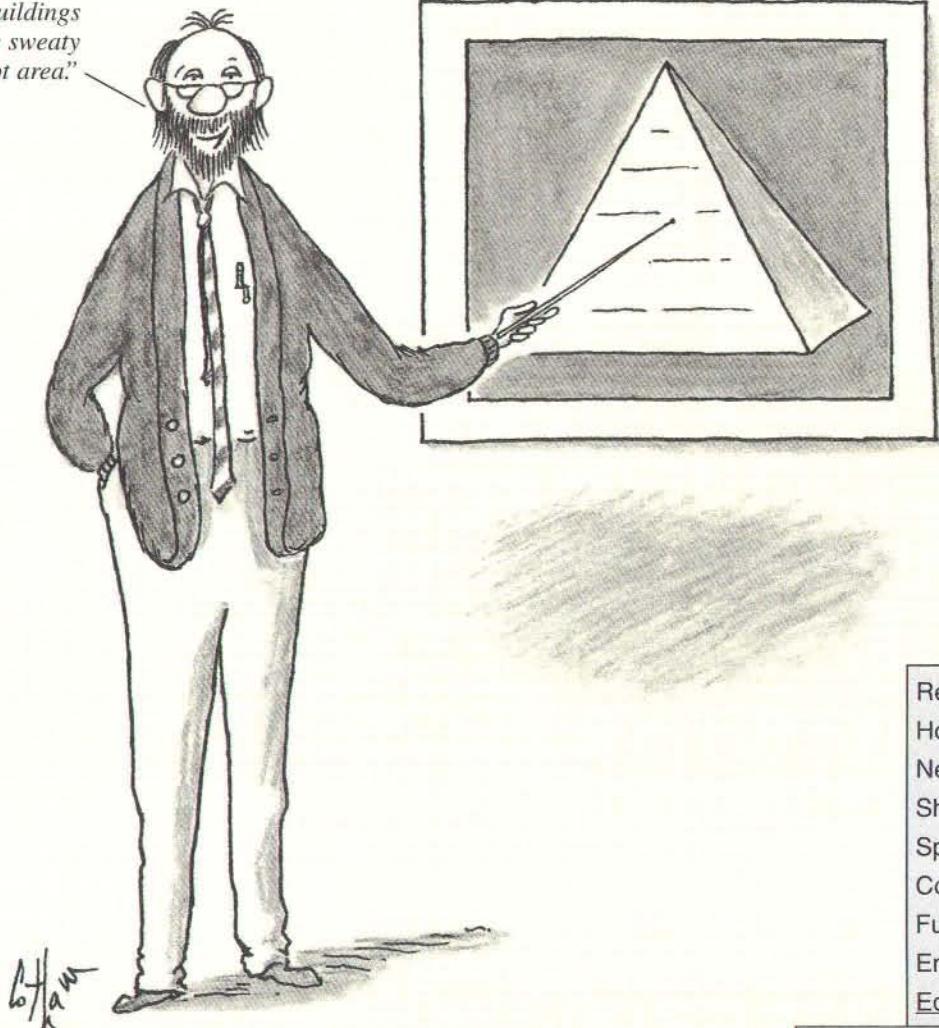
Marketers aren't on the Web for exposure, but results. So the Web must pick up where traditional advertising leaves off.

HotWired, the Web site started by the parent company of this magazine, sold ad placements to nearly 40 companies by the end of 1995, says Andrew Anker, *HotWired*'s president and CEO. Demand for advertising has been so strong that *HotWired* was able to raise \$7 million from a group of international investors in return for a 15 percent equity stake in the privately held Web venture.

But when it comes to actual revenue from advertising, there might be less to

based on how many people might see the ad. This ratio, the cost per thousand (confusingly shortened to CPM), is ingrained into the consciousness of every advertising executive. The television industry uses ratings to set ad prices, and the publishing industry uses audited circulation figures. In this model, a network television show will typically have a CPM of about \$5. A newspaper or magazine will be priced at about \$40 per thousand readers, since they provide a smaller but more targeted

"In today's class we'll be studying these pointy buildings that were built by those sweaty people in that really hot area."



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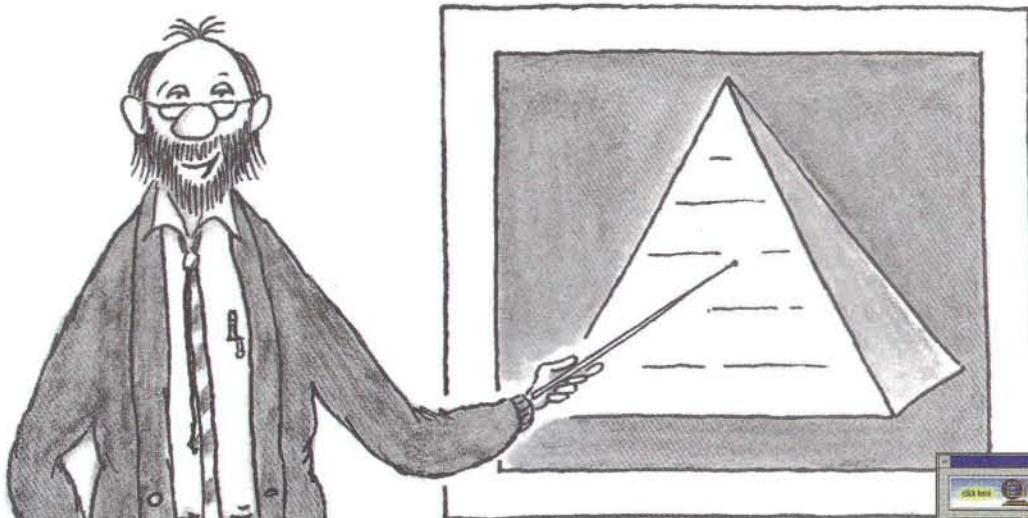
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Current Market Status					
Symbol		Ticker	High	Low	Prev. Day
Auto-Owners Industries	AOI	AOI	\$6.00	\$5.98	+\$0.00
Baldwin Corp.	BALD	BALD	\$10.00	\$9.95	+\$0.00
BBDO Compcite	BBDO	BBDO	\$105.21	\$104.00	+\$0.00
Borden Paints	BOP	BOP	\$1.00	\$0.95	+\$0.00
Country		Ticker	U.S. \$ Conv.	U.S. \$ Conv.	U.S. \$ Conv.
Fiat	FEY	FEY	\$0.939000	\$0.939000	\$0.939000
General Mills	GMI	GMI	\$1.00	\$0.95	+\$0.00
Glaxo, Plc.	GLX	GLX	\$1.00	\$0.95	+\$0.00
Exchange	Last Bid	Change	No. of Shares	Volume	Off. Price
NYSE	214.21	+0.388	11,620	366	\$214

of topics. In fact, you can customize your own news service to automatically gather what's important

Current Market Status

	Ticker	High	Low
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Blue Chip Industrial	BII 38	\$62.95	\$47.64
Small Stocks	SST 38	\$10.25	\$8.50
MSDQ Composite	MSDQ	\$103.21	\$97.00
London Stock Fx.	LSF		
Options			
Stock Options	Ticker	U.S. & Enviro.	

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That experience in hand, Volvo decided to scale back its Web advertising and simply promote the site in TV and print ads while continuing to provide information online too expensive to disseminate through traditional media. Austin says he just wasn't getting value for money spent, especially since sites such as *HotWired* were unable to provide hard numbers on the demographics. "I'm not comfortable throwing more money at advertising the site right now," he says. "We're not here to sell Web sites. Web sites should be here to sell cars."

That leads to the third principle of Webonomics: Marketers are not on the Web for exposure, but results. Picture the process of prospecting for customers as a giant funnel. Traditional mass-market advertising on TV and radio or in national newspapers and magazines works at the wide mouth of the funnel. No ad on a Web site will ever provide the mass exposure of those media. But the Web can work its wonders at the funnel's bottom, or spout. "The most important thing the Web can deliver is a fully qualified lead or customer," says Emily Green, a Forrester senior analyst who studies Web trends. Everett puts it this way: there are four steps to landing a customer - tell, sell, link, and think. A traditional ad, he says, will "tell" you that a product exists and "sell" you on its benefits. The Web, however, must pick up where traditional ads leave off. If Chrysler does its job right on the Web, he says, it will "link" qualified and interested buyers into a virtual showroom and give them enough information to "think" about whether they are actually going to purchase the car.

Marketers commonly pay big money for those qualified and interested consumers. That's what direct mailing lists are all about. Of course, gathering up the right customers and funneling them to the right advertisers is a difficult process. But it can be done very efficiently on the Web. Consider the Web site of Individual Inc., the Burlington, Massachusetts, company that provides an online news service called *NewsPage*. Visitors fill out an electronic form in which they choose among 850 business news topics - from genetic

research to network security to groupware. After receiving the profile of a certain user's interests, Individual's software scans a constant stream of 15,000 incoming stories from 600 daily and weekly publications, and provides a customized news digest on demand to each user. During the first two months of business, its Web site attracted 50,000 users who actually paid \$2.95 to \$6.95 per month for the service. Subscription fees make up one-third of the site's revenue, the remainder coming from advertising.

Since the company knows the specific interests of its customers, advertisers can target the exact consumers they want. Silicon Graphics Inc., for instance, sells Web server computers, so it has sponsored one of the news sections about the Web. IBM's Lotus division has sponsored the news section on groupware. And 3Com Corp., which sells network hardware and software, has sponsored the section on local area networks. A consumer with those specific interests will see only related ads. This way, each advertiser gets to appeal to the prospects it values most.

Individual has had a hard time setting a price on those ad placements. For every advertiser, value is different. So, it simply auctions the available placements to the highest bidder. In other words, each advertiser pays what it thinks the ad is worth. (This scheme, however, will be offered along with more traditional pric-

- *USA Today* estimates how many times an advertiser's image or logo is uploaded, charging \$30 per 1,000 people who will do so over a minimum two-month period. *USA Today* also charges \$20 for every 1,000 customers it estimates will click on the logo and link to the promotional site. This way, advertisers are not paying to reach all 70,000 to 80,000 people *USA Today* estimates it attracts every day, rather only the ones who are likely to see and act upon its ads.

Ultimately, the ideal model for selling advertising would arrive if *USA Today* and others took the next logical step: not charging anything upfront for an ad placement, and only charging for the real, measurable results. This method naturally holds great appeal to advertisers, because it means that advertisers pay a low amount (or nothing at all) if the content provider fails to deliver consumers, and a higher amount if the ad succeeds. This way, both parties share the risks and rewards. The ads become like salesmen working on commission.

"Most marketers will go for that choice rather than pay \$30,000 upfront," says Everett. This new, result-oriented way of advertising is made possible by a slew of new audience measurement technologies for the Web. Start-ups like WebTrack, Digital Planet's NetCount, and Internet Profiles - or I/PRO - are getting into the business of verifying and analyzing the

**"In an online world flooded with free information,"
says Bernoff, "users will treat info charges
as damage, and route around them."**

ing in early 1996 at the request of several advertisers.) In its first three months selling Web links, says co-founder John Zahner, Individual took in around \$250,000.

Another innovative way of charging for advertisements comes from *USA Today*. This is how it works: Gatorade, for instance, chooses to place its logo within the colorful flag at the top of the paper's online sports section. Instead of trying to charge Gatorade a random fee - say \$45,000 for a three-month placement

numbers kept by all Web server computers. When a user visits a Web site, software running on the server at that site keeps a log of how many file-lookups - or hits - the user invokes. For instance, a Web page with text and four graphical elements might translate into five hits. Those who run the most popular Web sites often brag about their hit count. The Web servers run by *Playboy*, for instance, were logging about 3.2 million hits per day by December. *ESPN SportsZone*, a site run

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Ad: Amit Goyal Photo: Anant

TV so real, you'll get too close. 1 800 so simple.

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by Paul Allen's Seattle-based Starwave Corp., reached 1 million hits per day last May, 2 million by mid-August, more than 3 million by Labor Day weekend, and

angling to do for the Web what Nielsen has done for television - namely, measure how many potential people might see a certain advertisement. But unlike TV,

you are a dog, along with what Zip code your doghouse is in, what kind of leash you wear, and what flavor Milk-Bone you prefer and why. When you disclose this, you become a very valuable dog indeed. But there has to be a damn good reason to give out this information.

This brings us to the fourth principle of Webonomics: Customers must be rewarded when they disclose information about themselves. Many consumers are beyond worrying about data spies invading their privacy and are willing to make a trade-off - if the deal is a good one. "If someone tells me who they are and what car they drive, they should get a cookie," says Everett. That reward can be in the form of a \$100 or \$500 rebate on a new car or, say, the promise of a free CD player. To a marketer, of course, information about your usage of a product makes all the difference in the world. "If you tell me that your minivan is 5 years old," says Everett, "I want to get an attractive lease rate to you immediately."

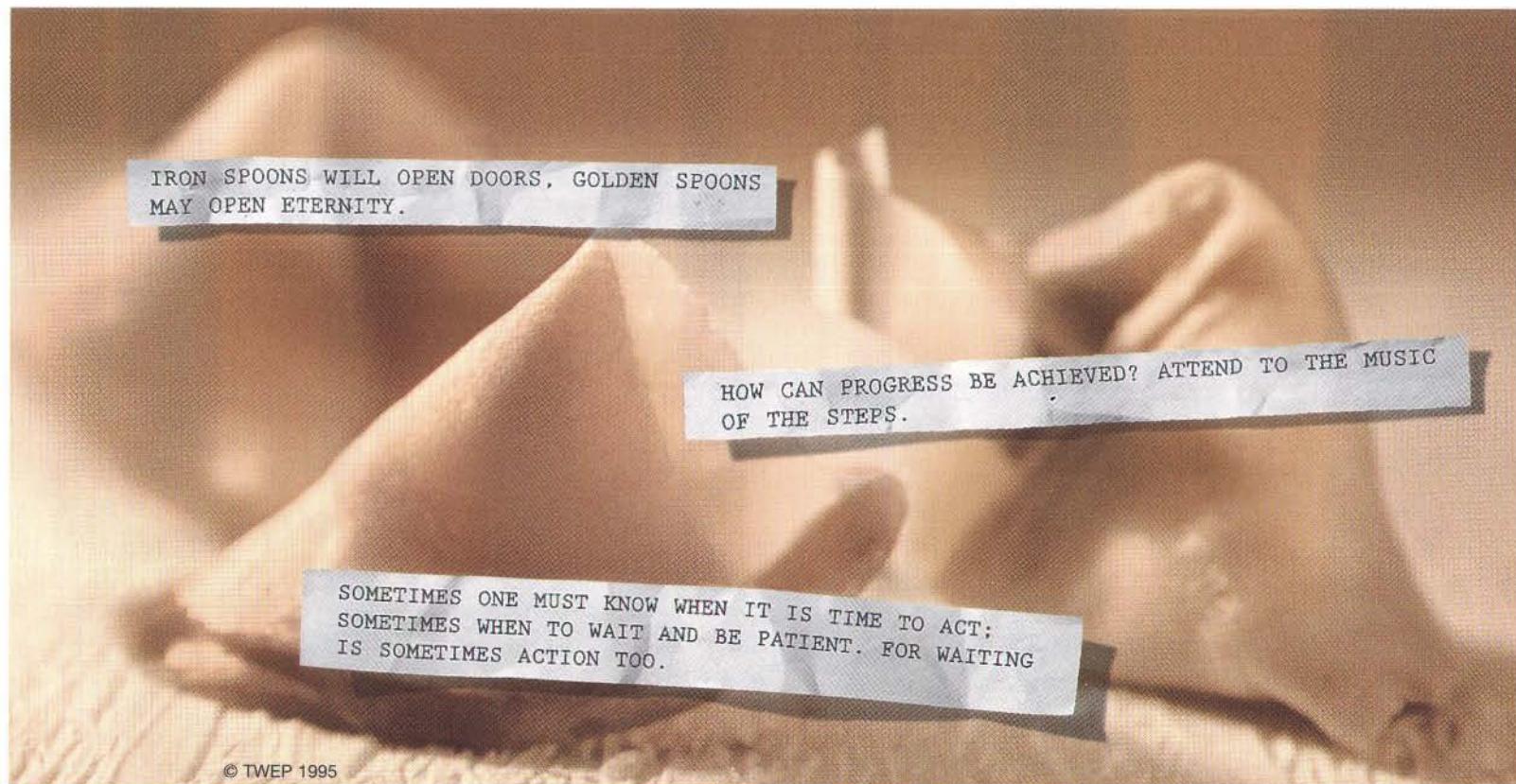
"If someone tells me who they are and what car they drive, they should get a cookie," says Everett.

4.5 million by Thanksgiving, says Starwave CEO Mike Slade.

Along with many others, I/PRO has begun auditing those server log files, verifying the information, and translating the hit-rate data into reports that are supposed to provide an objective measure of how many individuals visited each site. I/PRO, based in San Francisco, already has more than 75 subscribers to its Web measurement service, including advertisers such as Chrysler and media companies like USA Today and Time Warner. Last summer, I/PRO received a big boost when the A. C. Nielsen Company bought a stake. With Nielsen's help, I/PRO is aggressively

the potential exists on the Web to provide deadly accurate numbers.

Still, there's something far more important to marketers than even measurement data. These are, of course, the demographics (such as income level) and the psychographics (such as buying patterns) of each consumer. To date, few content providers have been able to tell advertisers much, if anything, about their audience. "We don't know who these people are," laments Everett. Browsing the Web is pretty much an anonymous activity. The *New Yorker* cartoon about how nobody knows you're a dog on the Internet still holds true. That is, unless you tell others on the Net that



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Getting people to enter this kind of personal data in the computer is a tricky challenge - for both marketers and content creators. "It's a big problem," says Floyd. "You need to require people to register for your site to know who they are. But by requiring registration, you may lose them altogether."

That's exactly what began to happen at *HotWired*. In an attempt to tell advertisers something about its audience, *HotWired* had required a registration process for those wishing to log on to its site. You fill in your name and address, e-mail address, answer a few questions, and choose a user name and password. Within hours, the site e-mails you a confirmation. Then, every time you go to the site, you must enter your password. But as more and more content sites cropped up on the Web (most not requiring registration), *HotWired* found that many Web surfers were blowing by its site altogether. In response, last August, *HotWired* made registration an optional process.

But in keeping with the principle of rewarding consumers for disclosing information, *HotWired* has made sure the registration process isn't without its consumer

over the Web. Customers could not only maintain an updated list of their most frequently called numbers but also tell the system what time of day and week they

A psychographically identifiable dog

is a very valuable dog indeed.

benefits, says Anker. The software offers registered members customized views of *HotWired* content by remembering preferences users cited during enrollment. In addition, it recalls when registered users last visited the site and places all new content since that time under a special "What's New" section. Anker says the not-yet-profitable *HotWired* will continue to move toward letting registered users create their own interactive experience.

Another way of rewarding customers who disclose information is by practicing a new form of service-based advertising. Imagine a phone company that lets users tap into its customer service database

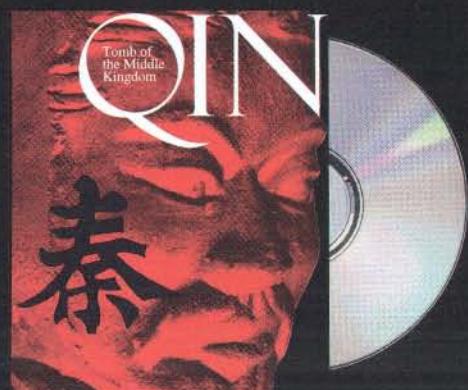
usually do most of their calling. Such a Web site could make it more convenient for users to create their own customized calling plan - at a favorable price. "To present your needs and have AT&T come back with a plan for you - it doesn't get any more perfect than that," says Floyd. Very few promotional Web sites, however, are performing these one-to-one marketing techniques.

More common is rewarding customers by providing entertaining activities in exchange for information. A simple example is the Stolichnaya Vodka Web site, where visitors can step behind a fully stocked virtual bar. First, you choose

Don't be fortune's fool.

It is wise to contemplate these generous words. Qin, the first Emperor of China, has spoken. Return to the Middle Kingdom. Explore and discover the perilous mysteries of Qin's untouched, subterranean palace.

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ingredients from screen menus and mix your own drink – all the while learning about Stoli's many flavors. Then you type in a name for your concoction and submit your recipe. Your creation instantly appears with your name on a list alongside other visitors' creations. Finally, you can browse the list and vote for your favorite. When I visited, the leading vote-getter was a concoction called "Bartender, I'll Have What the Guy on the Floor is Having." Not only is this a fun way for consumers to spend time thinking about Stoli's products – well, I found it fun – it's a good way for Stoli to learn the often unpredictable preferences of consumers.

Ultimately, such a site can turn into "an online focus group," says Eric Marcus, an Internet strategy advisor with CSC Index's Vanguard research program. The idea, Marcus says, is to engage your customers in an interesting, ongoing dialog about how you can improve your products and services. Rewarding customers to take part is a small price to pay for obtaining that edge, he says. What's more, doing it on the Web is much cheaper than convening a live group.

Which leads to the fifth and final principle of Webonomics: It's not the quantity of people you attract to your site that counts most but the quality of their experience there. A Web site that attracts just a few thousand loyal consumers will ultimately be more valuable than one in which a million new people visit each month but never return. In this sense, all the Nielsen-like measurement tools deployed become moot. Who wants the Web to become like television, in which the number of eyeballs you attract becomes the all-important measure of success? "If it becomes an eyeballs medium, it fails," says Green. The Web should not become yet another mass medium, but rather the first truly interactive one. In the words of Everett, it should be a place where you go to "link and think" – the place you go when you want to use your brain. ■ ■ ■

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Spam King!

Your Source for Spams Netwide!

Jeff Slaton has built himself a business out of spamming the Net.
And if anyone on the Net doesn't like it,
his friends Smith & Wesson are very prepared to talk.

By Simson Garfinkel

Do The Euphoria Tape alone the first time, and then with a lover. It's a phenomenon you will feel within the first 3 minutes of use — what you feel the rest of the time is unbelievable.

— Worldwide spam, October 1995



At \$425 a pop, the master spammer will flood the Net with your message, hitting, he claims, up to 6 million potential consumers.
Digital vigilantes protecting their turf, however, have other plans for Jeff Slaton.

were published on the Usenet group news.admin.net-abuse.misc. People were advised to phone or send e-mail to the Albuquerque firm, Rt.66, and voice their opposition.

Spamming is the now-familiar practice of deploying mass postings on Usenet and sending blanket mailings to Internet lists, and Jeff Slaton was poised to make a buck by selling his ability to do it. But the weekend after Slaton's first "blast," or all-out spam, Rt.66 got more than 1,300 complaints. A few days later, Slaton's first account with Rt.66 was yanked. "He is no longer a customer," says Bob Kelly, Web designer for Rt.66. "We will not take his money." Slaton's offense: abusing the Net.

Thrown off his first service after burning through several assumed names, Slaton set off on a seemingly endless sequence of comebacks, signing up with one of Rt.66's Albuquerque competitors, Internet Direct.

But Kelly called Internet Direct to warn them, and by the next day, Slaton's new account was axed as well.

That's the way Usenet has always dealt with spammers. Mail crusades. Intimidation. Harassment. The old-boy network. The technique is simple, if legally questionable. Simply publish the spammer's real name, home phone number, and address. Publish the name of his or her access provider. If everyone who is offended by the spamming sends a short message complaining about the apparent abuse, the resulting flood of messages will effectively put the spammer's computer — or at least his provider's computer — out of commission.

Such intimidation tactics have worked before. Back in 1994, lawyers Laurence Canter and Martha Siegel spammed Usenet with ads offering legal assistance with the US Immigration and Naturalization Service's "green-card lottery." Tens of thousands of people on Usenet sent complaints to Canter and Siegel's service provider, causing its machine to crash. Within a few days, their provider shut them down rather than risk a repeat, and after a few more spamming attempts, Canter and Siegel decided to back off and write a book about their exploits instead.

But this "Revenge of the Net" isn't working with Slaton, who has dubbed his business Spam King. He's not put off by the ire — in fact, it goads him on.

"I've been blacklisted across the nation," says the Spam King, laughing from his home in Albuquerque. "It is very difficult for me to get an Internet service provider to put me on, because they know what my agenda is." Instead, he's devised a much better approach: "I have people set up their own Internet service accounts. They give me their login and password, and then I launch my program."

Meanwhile, a group of Usenet news administrators and self-appointed network vigilantes have assembled a comprehensive profile on the spammer in recent months. They have posted his Social Security number, home telephone number (505/821 1945), even the number in his kitchen (since disconnected). They have posted the name of his employer (U S West) and his supervisor, along with her phone number. The



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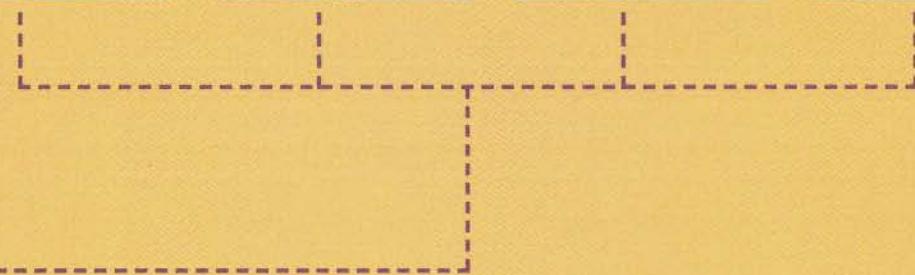
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message from these posters, while never explicit, is an obvious one. Cause trouble for Slaton. Destroy his credit. Get him fired from his job. Call him day and night. Punish him for sullyng the Internet.

Still, it's not working.

"This is a for-profit, commercial enterprise," says the 40-year-old Slaton, describing his spam-for-hire business plan. "I'm doing about 15 spams or mass postings a week. All of a sudden, there has been an absolute crush of demand for my service." And at US\$425 "per insertion," as he calls them, that adds up to more than \$300,000 per year.

Calls to U.S. West, where Slaton used to sell advertisements in the Yellow Pages, are useless: Slaton is on extended leave. And as for angry Netters publishing his home phone number, he sees it as free publicity: every time his phone number is posted, his business grows.

Slaton has even fueled the flames himself. Late last year, he tacked a special offer onto one spam: get your e-mail address *removed* from his database at a cost of \$5. "That was actually a hoax," Slaton confesses. "It was designed to stir up the beehive, to create controversy."

And Slaton's not even worried about

Siegel's book, he asked the folks at Rt.66 if they would mind if he spammed an advertisement from his account. Bob Kelly would have nothing to do with it. "We said, Listen, this is not the way to do it. Why don't you go read a *real* book about making money on the Internet instead of just being an asshole?"

But Slaton had better plans. According to Rt.66, he let his monthly fee with the company lapse. Then, three days before the provider would have canceled his account for nonpayment, Slaton sent out his advertisement, hawking blueprints to the first atomic bombs.

The advertisement went everywhere. It went out to Usenet groups that might welcome the information, like sci.energy and rec.pyrotechnics. It went to groups that had nothing to do with the subject, like comp.os.msdos.4dos and sci.math. And it even went to groups where the message might be considered totally out of line. "One of the places he advertised his blueprints of nuclear bombs was a brain tumor support group," says Kelly.

Slaton was unremorseful. "I'm a charter member of the National Atomic Museum. The authentic reproductions were very high quality. Dr. John Hopkins was the

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One way Slaton has improved on Canter and Siegel's scheme is by going beyond the massive Usenet postings to aggressively spam mailing lists and individuals through e-mail. "I have the technology and the capability," Slaton boasts. "I can reach 6 to 8 million people." Did you receive a note in your mail queue from Scott Glasrud, who was running for local office in New Mexico? Did you get the message last October selling *The Euphoria Tape*? Have you downloaded ads for Compass International Telecom of Boston? If so, then you've been hit by a piece of Slaton's flying spam.

For Slaton, collecting e-mail addresses isn't a problem. One of the easiest ways, he says, is culling them from Usenet itself: many people sign their posts with their addresses. But an even more effective way to spam, the expert explains, is by sending mail to professional and special-interest lists.

In one sense, this is target marketing gone mad. Before the Internet, it was in advertisers' best interest to "target" the people who received their ads. After all, there's no reason to spend the money to send denture cream advertisements to high school students. But in the crazy world of Internet economics, Slaton explains, "It's just as cost-effective for me to send to 6 million e-mail addresses as to 1 million e-mail addresses, so why bother being selective?

"In fact, prequalifying a prospect is a dangerous thing, simply because you might well miss a whole group of people out on the fringe."

Increasingly, Internet mailing lists are closed to prevent this sort of abuse: some mailing lists will allow only members of the list to post, and others are set up to accept mail from a moderator only. But

In the crazy world of Net economics, says Slaton,

"It's just as cost-effective to send to 6 million e-mail addresses as to 1 million, so why bother being selective?"

someone showing up at his door carrying a big stick: "My friends Smith & Wesson are very prepared to talk."

I have a friend who just retired as the Associate Director of Los Alamos Nat'l Labs in New Mexico. We worked together to obtain the plans to the FAT MAN & LITTLE BOY Atomic Bombs. (Unique commemorative, declassified and "just" released!)

This is a "must have" for anyone interested in Science or History....

— Jeff Slaton's first spam

Slaton started spamming in July of 1995. After picking up a copy of Canter and

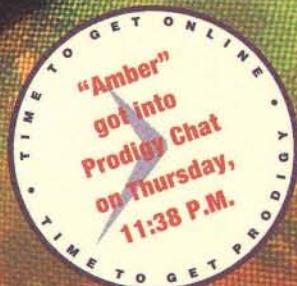
associate director of Los Alamos National Laboratory. He thought it was a good idea." At \$18 each plus shipping, Slaton says, "We sold thousands and thousands of them all over the world."

Looking back, Slaton says he'd taken the Canter and Siegel idea "up about a hundred notches." And from there? He began advertising his own enterprise, the best way he knew how.

```
From: SpAmKiNg@505-821-1945-
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Subject: Let Us Help You Spam the Net!
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started
when
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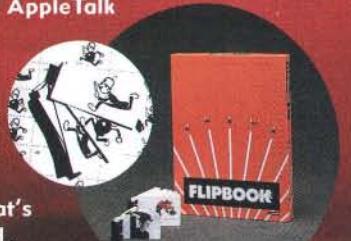
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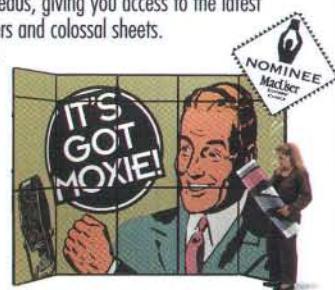
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Slaton scoffs at such technical solutions. "It's a band-aid approach," the Spam King argues. "It makes it a little more challenging for somebody who's committed."

Patrick Townsend, editor and publisher of the Internet *Telecom Digest*, asserts that Slaton has another way of getting addresses: by raiding them. "He broke in here and sent a lot of nasty messages to my mailing list and my newsgroup," Townsend says. According to Townsend, Slaton was able to obtain a complete subscriber list using a relatively obscure feature in sendmail, a Unix mail utility primarily used by sysadmins, and then sent his ads directly to readers, bypassing the moderator.

Slaton denies breaking into the Telecom mailing list: "Totally untrue! I am not a cracker," he says. "I have no use for Townsend's subscriber list as I have many times more e-mail addresses on my database. Why would I waste my time?"

But Townsend went to battle. He published Slaton's voicemail number several times, republished his Social Security number and other information, and suggested that if Slaton saw no problem with irrelevant messages going out over the Net, "perhaps he would see no problem with irrelevant messages going to his

to include their electronic addresses in ads and to set up their own voicemail boxes. "You can use this phone number in your advertising and then disconnect it in the future," Slaton says, "without ever compromising your true number."

Not surprisingly, the customers who seem to be happiest with the Spam King's work are those who are not directly involved with the Internet and see it only as a means of promoting their product.

"You cannot beat \$425," says Ralph Seebach, president of California-based Amelox Incorporated. Last fall, Seebach read an article about Slaton in the *San Jose Mercury News*, then badgered the paper to get a contact number. The reason: Seebach wanted to advertise his \$40 program designed to tutor junior college students on real estate, and though Slaton's number is plastered all over Usenet, Seebach didn't have an Internet account to find it.

True, Seebach admits, he knew spamming would challenge his company's reputation. But he didn't care—he believed the sales leads he'd gain would outweigh any harm. "I understand," he insists. "The only problem is, how do you get junior college students? It's almost impossible

If spammers like Slaton, and people who hire them, get enough of the Net's special brand of harassment, perhaps no reputable business will risk it.

voicemail. I took the logic," gloats Townsend, "and put it in reverse."

Subject: I am responsible for The Euphoria Tape.

I wish to discuss the terms of my surrender.

— Spam King customer, *Telecom Digest*, October 24, 1995

When attacks only made Slaton's spamming more steadfast, indignant Net users went after his customers. The Internet, after all, was turf worth protecting from a potential onslaught of junk mail.

Once again, however, Slaton seems to have dodged, advising his customers not

unless you get national coverage."

And Seebach is just one of many. After the *Mercury News* article was published, the paper received dozens of phone calls from readers looking for the Spam King.

Indeed, Slaton reports business is going so well that he's getting his own site on the Net, complete with his own T1, tapping straight into the network's backbone.

"The business is going to have a little more respectability than what I'm doing currently. It will involve more of the national accounts like MCI and Chevrolet," says Slaton, though he declines to name any contacts. "I have been in conference with them already, and they are showing interest."

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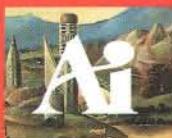
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However, don't expect to see spams for MCI or Chevy any time soon. According to Slaton, these companies don't want "the entire blast," but are instead - strangely enough - interested in segmenting the Internet, sending their ads only to people who want them. Meanwhile, Slaton says, he has started sending out surveys of those he has spammed, so he can build a demographic database and "segment my list" to accommodate his clients' needs. Imagine that.

"Business will continue ... but with a twist," explains Slaton, who announced at the Comdex trade show last November that he would cease spamming Usenet and would allow people to remove their names from

his list of direct e-mail solicitations free of charge. Slaton also said that he would be setting up an electronic newsletter of his own, covering topics such as Internet regulation. But whether Slaton really stops spamming - or simply stops signing his name - may be difficult to determine.

The Telephone Consumer Protection Act of 1991, 47 USC § 227(b)(1): It shall be unlawful for any person within the United States - (C) to use any telephone facsimile machine, computer, or other device to send an unsolicited advertisement to a telephone facsimile machine....

Is anything about spamming actually illegal? "US Code 47 says it's illegal to send commercial solicitations to a facsimile machine," says Robert Raisch, an 18-year veteran of the Internet and founder of The Internet Company in Cambridge, Massachusetts. "A fax machine is defined as any machine that connects to a telephone line and can render on paper."

Perhaps that covers a computer and an electronic mail system, but Raisch isn't sure. That's why he is working with a small group of people developing model

legislation for US Representative Edward Markey (D-Massachusetts), the ranking minority member on the House Telecommunications Subcommittee. That legislation would make it illegal to send out unsolicited commercial e-mail.

"It's postage-due marketing," complains Raisch, referring to the hourly-rate costs of downloading unwanted material. "It's really kind of disappointing to see that the only way people like Slaton can find

to make money on the Net is fundamentally stealing from others."

Others counter that increased legislation of the Net is precisely the wrong way to protect it.

"It is premature to suggest that we need laws on this," says Robert Smith, publisher of the

Privacy Journal, a Rhode Island-based newsletter that has been following the impact of computers on privacy for more than 25 years. "One good thing about the Net is that it's free of bureaucracy and regulation. It's self-governing unlike any other institution I know of. Users of the Net will figure out a methodology to combat this."

And he may be right. The Net is a wily, inventive opponent, and even if the network is regulated, it would be difficult to stop spammers based in the Netherlands or Tokyo. Besides, if spammers like Slaton, and people who hire them, get enough of the Net's special brand of harassment, perhaps no reputable business will risk it.

Or perhaps that's wishful thinking.

Offering up a gold mine of 6 million potential consumers, Jeff Slaton isn't just selling spams - he's selling dreams. ■ ■ ■

Simson Garfinkel (<http://vineyard.net/simson/>) writes about technology and privacy from his home on Martha's Vineyard. His new book, Practical Unix and Internet Security, will be published in February by O'Reilly & Associates.

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You Get What You Pay For

By Fred Hapgood

"Computers are useless. They can only give you answers." — Pablo Picasso

Over the last 10 years, the character of our national politics has become dominated, even overwhelmed, by the loss of American prosperity. Our pain seems to come less from the absolute decline in the average wage (20 percent over the last two decades by some calculations) than from the loss of confidence that the economy will again grow the way it did between 1870 and 1970. So much has changed: The communications revolution is bringing immense populations, all eager to work and shockingly underpaid, into the world labor market. Machines are getting steadily smarter. Organizations are learning to run leaner. While all these points might not prove that we face a steady decline in median wages, they sure suggest it.

But wage declines, logically speaking, do not rule out a prosperous life. We could get just as rich riding price levels down as we have riding wage levels up.

This point may seem entirely academic to many of us, since the idea of falling prices is alien to our experience. However, this is to some degree an illusion, since price increases stick in the mind more firmly than decreases. The same processes causing downward pres-

sure on wages are also affecting the prices of a wide range of goods, including food, consumer electronics, textiles, chemicals, energy, industrial materials, and many items of manufacturing equipment, from machine tools to steel plants. Today, an hour of the average American wage, shrunken as it is at US\$10, can buy 15 pounds of chicken, a watch, a fully loaded camera, 10 dozen eggs, a new paperback, two solar-powered calculators, half a shirt, 20 megabytes of data storage, eight gallons of gas, 100 kilowatt-hours, a dozen pens, 15 hamburgers, 20 pounds of flour, four movie rentals, or a 40-minute phone call between New York and Los Angeles. These are all absurd prices, historically speaking.

Perhaps the most interesting example is digital hardware, such as computer processors and peripherals. Unlike most industries, which will lower prices only grudgingly and always press for an opportunity to raise them back up, the digital hardware industry has institutionalized continuous price cuts. Marketing strategists plot the trends, extrapolate the curves, and design to hit those pricing points. The designers and engineers, who are all convinced they have to meet these targets to keep their jobs, come through every time. (Though this brings prices down steadily, it does so in a very controlled way. Plots of the price behavior of digital hardware are usually straight as a roof line, a level of execution that reassures investors they will not be caught in a deflationary spiral.) Digital hardware shows that it is possible, at least in theory, for an industry to lower prices deliberately and recurrently, decade after decade, and still prosper.

Of course, prices in most other industries drift down much more slowly, or even rise, as they have in health care. Nobody finds this

I wish the Web had a life-expectancy server. You would call up a Web form that asks for a batch of demographic and lifestyle information, and it would tell you in statistical terms how much longer you have to live. ("At the rate you're going, you have 17.3 plus or minus 3.1 years left.") It could even offer a commentary on how much the outcome would change if you gave up smoking, moved to the country, carried a gun,

improved your relationships, and so on.

Life Server

By Phil Agre You could have a continual update delivered to the bottom of your computer screen, with the seconds ticking off your life expectancy. The clock might tick at different rates, or it might even tick backward as updated predictive information becomes available.

— Phil Agre (pagre@weber.ucsd.edu) teaches communications at the University of California, San Diego.

A lot of the discussion about the right to use encryption focuses on the First Amendment right to free speech. But

the Second Amendment may point to a better argument.

Remember, the Second Amendment was conceived so that people could protect themselves against the emergence of a tyrannical federal government.

Today, this function of arms is mostly irrelevant: the Militia of Montana may scare its neighbors, but it doesn't scare the United States Army.

Yet the advent of strong encryption — and the related technologies of digital cash and anonymous remailers — could allow for an invisible economy. Massive tax-revolt technology could take care of a tyranny pretty well.

It took a great deal of courage for the Founding Fathers to add the Second Amendment. I don't think today's politicians have the same faith in the people. But I hope they prove me wrong.

— John Stoner (jstoner@interaccess.com) is an independent Internet consultant in the Chicago area.

Cyphermilitia

By John Stoner

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— John Stoner (jstoner@interaccess.com) is an independent Internet consultant in the Chicago area.

"The difference between mailing lists and newsgroups is the difference between inviting a group of friends over for wine on a Sunday evening and putting a billboard that says 'Free Booze Here!!!' in your front yard." — Lazlo Nibble

Jones's Law

By Ray Jones

Spammers make up some fixed percentage of all new users on the Net. (One hopes people stop spamming after they leave the newbie phase.) The Net grows exponentially, so the number of newbies is proportional to the size of the Net, and, by association, the number of spammers is also proportional to the size of the Net.

Result: the annoyance caused by spammers grows as the square of the size of the Net.

— Ray Jones (rjones@pobox.com) works for a 3-D software company.

"Our machines are increasingly lively and we are increasingly inert." — Donna Haraway

unnatural; we tend to think that prices come reasonably close to the "real" cost of making goods — the cost defined by the physics of manufacture — so there are good reasons why they don't drop. The digital hardware sector suggests a second theory: that there is tremendous room to lower prices in almost every sector, and that prices are kept artificially high by inadequate technologies, poor organization, sheer waste, and pervasive attitudes that equate high price with high value. (How many times a day do you hear someone observe "You get what you pay for"? How often do you say it yourself?)

Now imagine a culture that crossed over to the deflationary road to prosperity. For one, its social welfare perspective would be quite different. A society committed to the wage-inflation model sees low-paid populations as victimized and handicapped. A system organized around price deflation would see a pocket of consumer demand. The natural response of the inflation culture is to simulate the effect of high wages with a subsidy of some sort, a direct or indirect virtual wage; the deflation society pokes around to find what is preventing prices from following their natural trajectory downward, then fixes the plumbing. An inflation society sees a problem; a deflation society sees an opportunity.

A deflationary culture would fight malnutrition not with food stamps or surplus food programs but by unblocking the

natural decline in the cost of producing and distributing food, would address homelessness not with rent subsidies but by deflating the market price of basic housing, would confront access to health care and cost containment not by supporting obscenely high prices with subsidies but by reversing the irrationalities that have allowed medical costs to rise by a factor of 35 in the last 40 years. (Veterinarians often deliver identical medications and services offered by physicians — at ten to a hundred times less. Why is that again?)

Perhaps the largest crack in the wage-inflation model is that it benefits only the fraction of the society that has "good jobs at good wages." Low prices benefit everyone, including those who don't want a "good job": youths who want to pursue esoteric experiments in music or art, parents who would like to spend more time with their children, seniors who want to keep working yet at a slower pace. These people may not meet the standards of most subsidy programs, but a decent society should accommodate their aspirations even so.

The simplest and strongest argument for a low-price prosperity strategy is that it sails with the winds now blowing through the global economy instead of against them. The world is settling on a standardized basket of goods and services; the number of people looking for ways to sell into this basket is growing very rapidly; the pace of technological innovation is accelerating almost as fast as everyone says it is; barriers to trade are falling everywhere. We must look carefully at the professional subsidies and licensing monopolies that

For 15 years, I've heard jeremiads about videogames and how they're making kids into malignant, illiterate little zombies who massacre people en masse after playing too much *Mortal Kombat*.

What a crock.

I am one of those video-game babies. I was born the same year as *Pong*. And I think videogames have been perfect training for life in fin-de-

millénaire

America. Just navigating through an urban landscape, I have to confront a world of lurid graphics, blaring music, and rampant violence. *Frogger* was the perfect trial run.

In a videogame world, everything happens at once and has to be dealt with in real time. This is what cognitive psychologists call parallel processing. What a shame, say critics, that videogames pump up kids' parallel processing abilities at the expense of contemplation and linear, serial thought.

It used to be a serial world, I guess. But it's not anymore. I need to think like a *Donkey Kong* jockey. Yes, videogames have fundamentally shaped my brain. Thank god.

— J. C. Herz (mischief@phantom.com) is the author of *Surfing on the Internet*.

Video Baby

By J. C. Herz
millénaire
America. Just navigating through an urban landscape, I have to confront a world of lurid graphics, blaring music, and rampant violence. *Frogger* was the perfect trial run.

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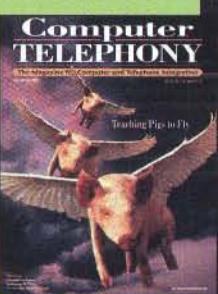
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– Fred Hapgood (hapgood@pobox.com) is a freelance writer specializing in science and technology.

Manglemania

By Rogier van Bakel

"Leadership is nature's way of removing morons from the productive flow." – *Dilbert*

I knew my usual mode of transit would have to change when I moved from the Netherlands to the United States. Back home, I rode bikes, trams, and trains. Where I live now in rural Connecticut, everything is a car ride away. Public transportation is nonexistent. So I finally had to learn how to drive. Just one problem no one told me about: to get my license, I had to relinquish my name.

"Van Bakel?" A puzzled look from the Department of Motor Vehicles clerk who checked my papers. "That's your last name? Two words?" I nodded and said that because the license would be my only official American picture ID, everything had to be accurate. Especially my name. After some listless pounding on the keyboard, the clerk turned back to me with a sullen expression. "Can't do it. The computer allows just one word in that area. It's going to have to be Vanbakel from now on. No space."

Great. So now the only piece of nationally accepted identification I have misspells my name, out of "technological necessity" – or, more likely, bureaucratic laziness. Over time, my license will no doubt spawn many more documents that also misidentify me.

I'm sure I'm not the only one who finds all this a bit bothersome. On one hand, we immigrants don't want to be too persnickety. On the other, isn't it interesting that not everyone is called John Smith or Mary Miller? I've always liked the metaphor of America as a salad bowl, not a melting pot. But even now, the old Ellis Island mentality – where immigration officials carelessly mutilated many a family name whose spelling was unfamiliar – is alive and well. At least at the DMV.

No, it's not just the license. For a people consisting almost entirely of immigrants, Americans can be amazingly careless when it comes to spelling "foreign" names. Roughly seven out of ten letters and publications addressed to me mess up my name, even after I've spelled it out in a letter. Only last week, I received a package addressed to Van Winkle.

The manglemania is like a Colorado beetle: always multiplying and virtually unstoppable. Databases and mailing lists are big business. The spelling errors they contain spread to five, then ten, then twenty other such lists. By the time you've stomped out one error, a small army of new ones is ready to take over the identity-blurring work.

OK, so it ain't Bosnia. But many people feel their names are a crucial piece of who they are. In a country that prides itself on being a bastion of individualism, I'd like to claim the privilege to keep something as individual as my name.

– Rogier van Bakel (rogier@li.com) is a Dutch-born journalist who writes for European and American magazines.

Have you noticed how the Internet has not yet developed a simple signpost for electronic commerce? Nothing glitzy and 3-D – just a way to find "I have this to sell" Web

What's 4sale?

By Paul Nunes
pages among all the other

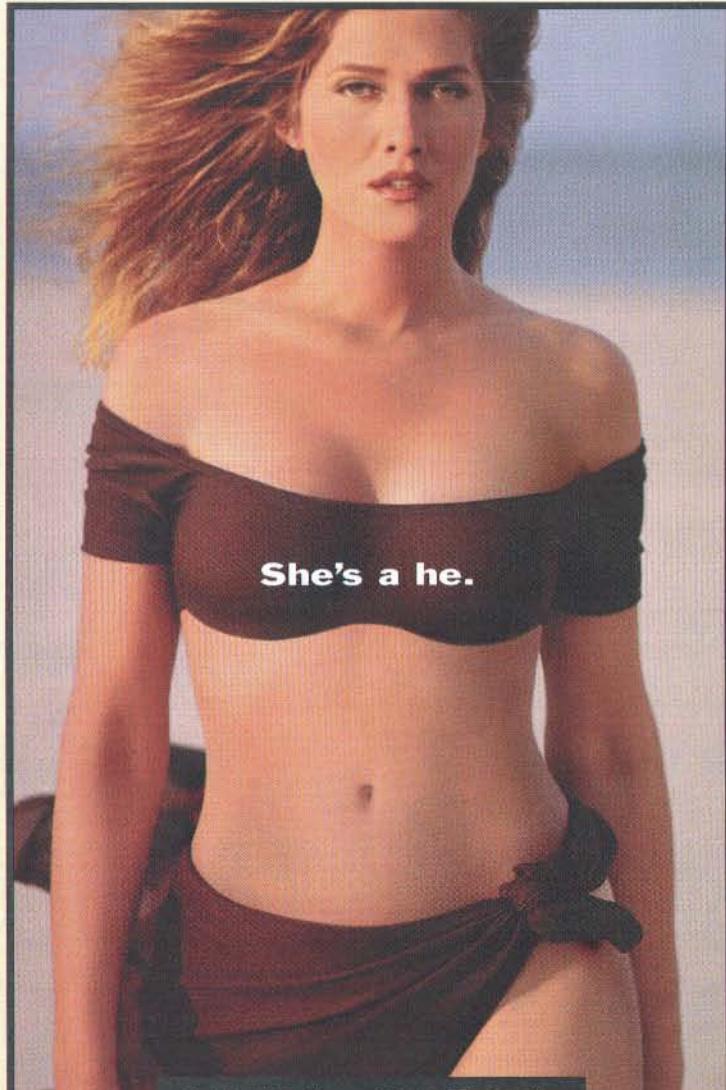
stuff crowding the Net. Yet all that is necessary is an agreed-upon keyword to act as the "For Sale" sign. My recommendation is the term *4sale*, which is surprisingly almost absent on the Web.

Suppose you want to sell radiator hoses. Simply create a Web page describing each one in detail, and add the keyword *4sale* somewhere in the text. Now, a search for "radiator hoses *4sale*" makes it possible to quickly find your products on the Web. *Voilà*, instantaneous marketplaces for every item imaginable with today's technology. And don't forget to use *2buy*!

– Paul Nunes (paul.f.nunes@ac.com) works in Andersen Consulting's Center for Strategic Technology Research.

"Worrying about a large institution, especially when it has computers, is like worrying about a large gorilla, especially when it's on fire." – *Bruce Sterling*

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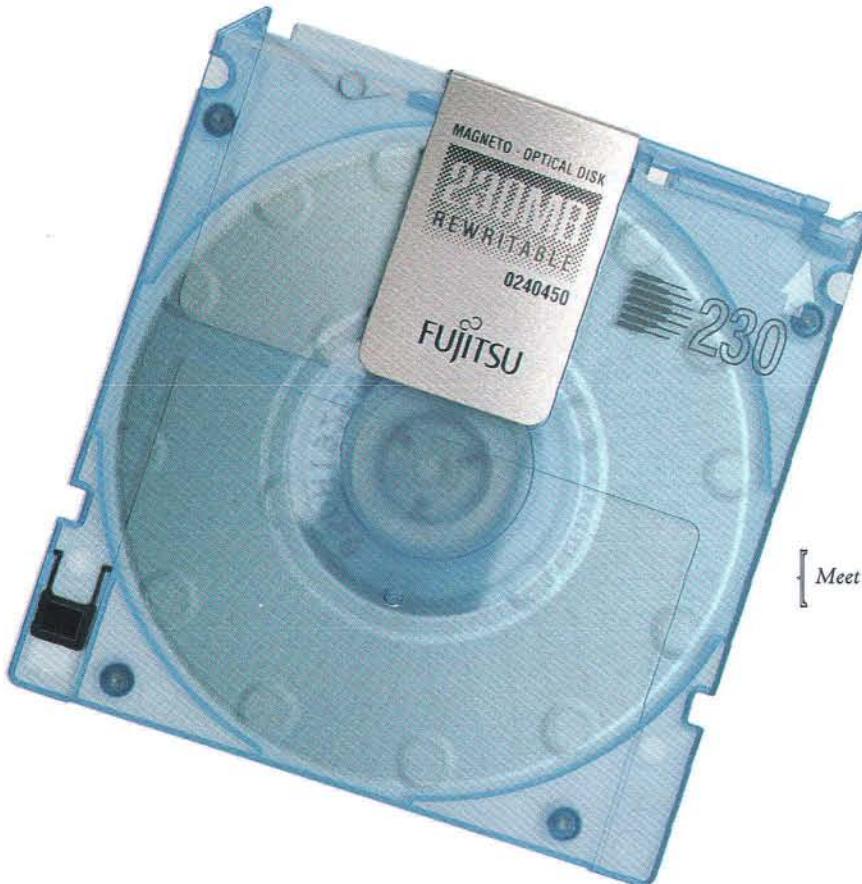


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Steve Jobs has been right twice. The first time we got Apple. The second time we got NeXT. The Macintosh ruled. NeXT tanked. Still, Jobs was right both times. Although NeXT failed to sell its elegant and infamously buggy black box, Jobs's fundamental insight – that personal computers were destined to be connected to each other and live on networks – was just as accurate as his earlier prophecy that computers were destined to become personal appliances.

Now Jobs is making a third guess about the future. His passion these days is for objects. Objects are software modules that can be combined into new applications (see "Get Ready for Web Objects"), much as pieces of Lego are built into toy houses. Jobs argues that objects are the key to keeping up with the exponential growth of the World Wide Web. And it's commerce, he says, that will fuel the next phase of the Web explosion.

On a foggy morning last year, I drove down to the headquarters of NeXT Computer Inc. in Redwood City, California, to meet with Jobs. The building was quiet and immaculate, with that atmosphere of low-slung corporate luxury typical of successful Silicon Valley companies heading into their second decade. Ironically, NeXT is not a success. After burning through hundreds of millions of dollars from investors, the company abandoned the production of

solve the most important problems we face. The future of the Web was in the hands of big corporations, he said. This was where the money was going to be made. This was where NeXT was pitching its products.

I couldn't help but wonder how this incarnation of Steve Jobs jibed with the old revolutionary of Apple and the early years of NeXT. As the conversation deepened, some of the connections slowly grew clear. Jobs's testiness faded, and he allowed himself to speculate on the democratizing effects of the Web and his hope for defending it against the threat of Microsoft. Jobs's obsession with his old rival took the form of an unusual proposal for all parties to voluntarily keep the Web simple and avoid increasingly popular client-side enhancements like HotJava.

In the old days, Jobs was an evangelist for American education and worked hard to get computers in schools. The partnership between Apple and educators was key in establishing a market for the Macintosh, while the NeXT machine was originally designed to serve primarily as a tool for students and teachers. Now, Jobs flatly concludes, technology can't help fix the problems with our education system. His new solutions are decidedly low-tech.

The new Steve Jobs scoffs at the naïve idealism of Web partisans who believe the new medium will turn every person into a publisher. The heart of the Web, he said, will be

THE WIRED INTERVIEW BY GARY WOLF

STEVE JOBS:

computers, focusing instead on the sale and development of its Nextstep operating system and on extensions into object-oriented technology.

Here at NeXT, Jobs was not interested in talking about Pixar Animation Studios, the maker of the world's first fully computer-generated feature movie, *Toy Story* (see "The Toy Story Story," *Wired* 3.12, page 146). Jobs founded Pixar in 1986 when he bought out a computer division of Lucasfilm Ltd. for US\$60 million, and with Pixar's upcoming public stock offering, he was poised to become a billionaire in a single day. To Jobs, Pixar was a done deal, *Toy Story* was in the can, and he was prepared to let his IPO do the talking.

A different type of executive might have talked only about Pixar. But even when given the chance to crow, Jobs kept talking about Web objects and his ambitions for NeXT. He was fixed on the next big thing. And that was fine. After all, people often become more interesting when they've failed at something, and with his fall from Apple, the struggle at NeXT, and the triumph of Pixar, Jobs is now moving into his second circuit around the wheel of fortune. What has he learned?

As we began our interview, Jobs was testy. He told me that he didn't care anymore about revolutionizing society, and that he didn't believe changes in technology could

commerce, and the heart of commerce will be corporate America serving custom products to individual consumers.

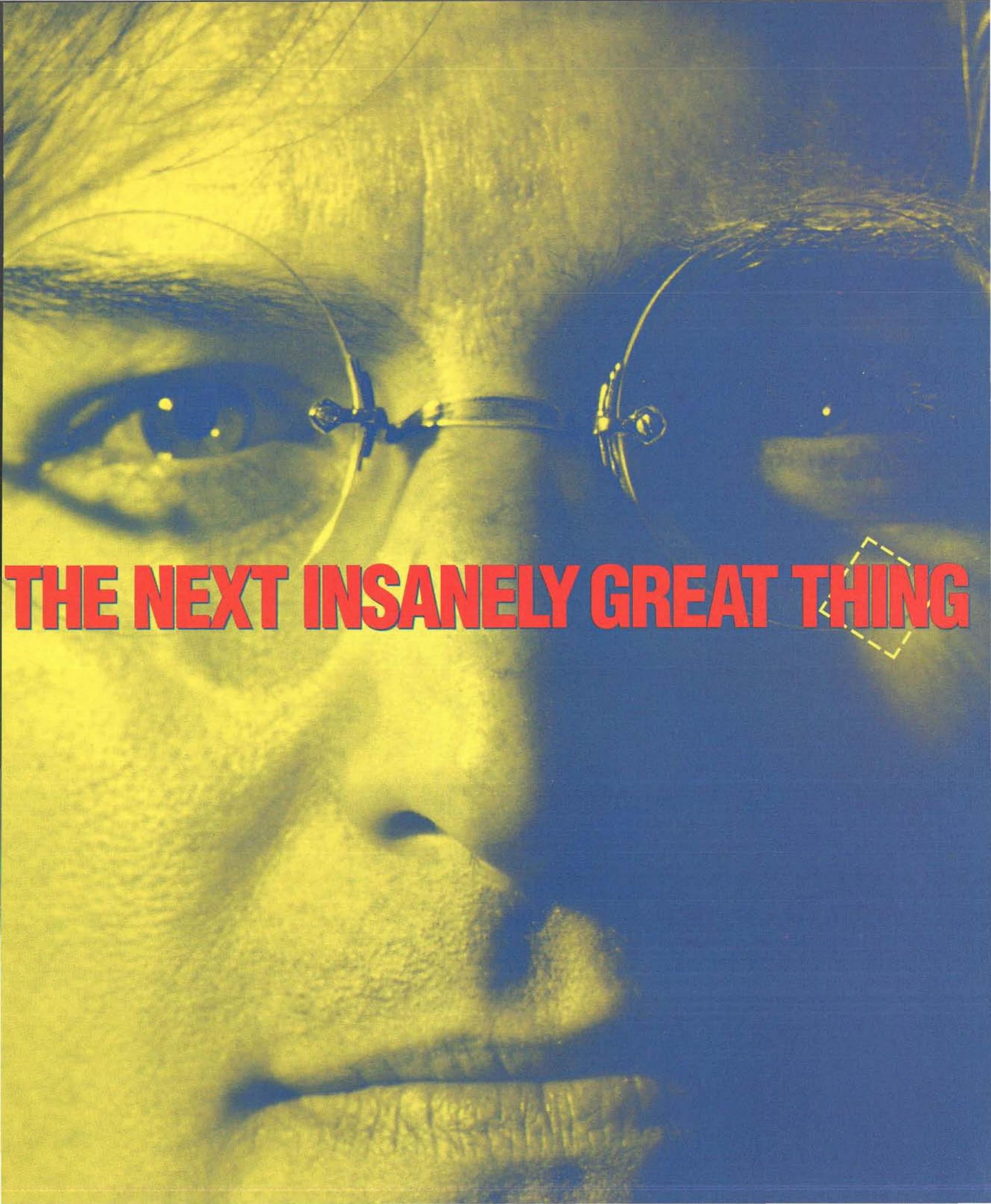
The implicit message of the Macintosh, as unforgettably expressed in the great "1984" commercial, was Power to the People. Jobs's vision of Web objects serves a different mandate: Give the People What They Want.

Wired: The Macintosh computer set the tone for 10 years. Do you think the Web may be setting the tone today?

Jobs: The desktop computer industry is dead. Innovation has virtually ceased. Microsoft dominates with very little innovation. That's over. Apple lost. The desktop market has entered the dark ages, and it's going to be in the dark ages for the next 10 years, or certainly for the rest of this decade.

It's like when IBM drove a lot of innovation out of the computer industry before the microprocessor came along. Eventually, Microsoft will crumble because of complacency, and maybe some new things will grow. But until that happens, until there's some fundamental technology shift, it's just over.

The most exciting things happening today are objects and the Web. The Web is exciting for two



THE NEXT INSANELY GREAT THING

reasons. One, it's ubiquitous. There will be Web dial tone everywhere. And anything that's ubiquitous gets interesting. Two, I don't think Microsoft will figure out a way to own it. There's going to be a lot more innovation, and that will create a place where there isn't this dark cloud of dominance.

Why do you think the Web has sprouted so fast?

One of the major reasons for the Web's proliferation so far is its simplicity. A lot of people want to make the Web more complicated. They want to put processing on the clients, they want to do this and that. I hope not too much of that happens too quickly.

It's much like the old mainframe computing environment, where a Web browser is like a dumb terminal and the Web server is like the mainframe where all the processing's done. This simple model has had a profound impact by starting to become ubiquitous.

And objects?

When I went to Xerox PARC in 1979, I saw a very rudimentary graphical user interface. It wasn't complete. It wasn't quite right. But within 10 minutes, it was obvious that every computer in the world would work

this way someday. And you could argue about the number of years it would take, and you could argue about who would be the winners and the losers, but I don't think you could argue that every computer in the world wouldn't eventually work this way.

Objects are the same way. Once you understand objects, it's clear that all software will eventually be written using objects. Again, you can argue about how many years it will take, and who the winners and losers will be during this transition, but you can't argue about the inevitability of this transition.

Objects are just going to be the way all software is going to be written in five years or - pick a time. It's so compelling. It's so obvious. It's so much better that it's just going to happen.

How will objects affect the Web?

Think of all the people now bringing goods and services directly to customers through the Web. Every company that wants to vend its goods and services on the Web is going to have a great deal of custom-application software to write. You're not just going to be able to buy something off the shelf. You're going to

Objects are just going to be the way that all software is going to be It's so compelling. It's so obvious

GET READY FOR WEB OBJECTS

**BY STEVE G.
STEINBERG**

Despite the hype and glitz graphics, the Web is a profoundly primitive technology. It treats today's powerful computers as if they were the rudimentary machines of the 1970s. On one side is the Web server, an idiot savant that responds to every request by sending out a hypertext document. On the other side is the Web client, a dumb terminal that simply displays documents and waits for mouse clicks.

This is about to change. Almost every major player in the computer industry is looking at ways to breathe life into the Web. These efforts, many of them still rough, seem to fall into three stages. The first stage involves making the client

and server smarter. On the server side, this means linking Web sites to information stored in local databases and spreadsheets. On the client side, it requires making every application you use - not just your specialized Web browser - able to access the Web.

Things start to get much more interesting in the second stage. The client and server will begin to exchange not just data, but programs. These little applications, or applets, will allow for new, powerful kinds of interaction. A stockbroker's Web site might send out an applet that acts as a front end for displaying a ticker tape at the top of your screen. An architect's site might provide a front end that lets you experi-

ence a 3-D walk through a planned building. You'll no longer have to worry about whether you have the capability to display a new kind of data type because the "capability" will be sent to you with the file.

In the final stage, the distinction between clients and servers will begin to blur. Code will flow in both directions. A client might send a small program to the server to perform a specialized database search. Applets will begin to resemble agents - nomadic programs sent out to find and gather information. The Web will become fully animated, energized by the proliferation of tiny bits of code, powered by the intelligence of computers.

The underlying technology necessary for these stages largely has been developed - the question is which version the market will choose. It's a crowded field, with dozens of companies trying to become players in setting the key standards for the future Web. Still, a few products and technologies are beginning to emerge as winners.

The outright winner is object technology itself. Long talked about by theoreticians and software engineers, this technique for constructing large programs out of many small object modules is finally being put into practice - in a big way. Software experts believe that objects offer the only route to creating distributed, heterogeneous systems.

have to hook the Web into your order-management systems, your collection systems. It's going to be an incredible amount of work.

The number of applications that need to be written is growing exponentially. Unless we can find a way to write them in a tenth of the time, we're toast.

The end result of objects – this repackaging of software – is that we can develop applications with only about 10 to 20 percent of the software development required any other way.

We see how people won the battle of the desktop by owning the operating system. How does one win on the Web?

There are three parts to the Web. One is the client, the second is the pipes, and the third is the servers.

On the client side, there's the browser software. In the sense of making money, it doesn't look like anybody is going to win on the browser software side, because it's going to be free. And then there's the typi-

cal hardware. It's possible that some people could come out with some very interesting Web terminals and sell some hardware.

On the pipe side, the RBOCs are going to win. In the coming months, you're going to see a lot of them offering a service for under \$25 a month. You get ISDN strung into your den, you get a little box to hook it into your PC, and you get an Internet account, which is going to be very popular. The RBOCs are going to be the companies that get you on the Web. They have a vested interest in doing that. They'd like to screw the cable companies; they'd like to preserve the customers. This is all happening right now. You don't see it. It's under the ground like the roots of a tree, but it's going to spring up and you're going to see this big tree within a few years.

As for the server market, companies like Sun are doing a nice business selling servers. But with Web server software, no one company has more than a single-digit market share yet. Netscape sells hardly any, because you can get free public-domain software and it's very good. Some people say that it's even

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written in five years or – pick a time. It's so much better that it's just going to happen.

that can keep up with the explosive growth of the Web. Cobbling together code without using objects could eventually lead to a system so large that it collapses under its own weight.

NeXT Computer Inc.'s WebObjects, a product not to be confused with the larger, generic Web-object concept, is representative of stage one of animating the Web. It allows a Web server to access information in databases or spreadsheets, and then to repackage this information into an HTML document. Think of WebObjects as an intermediary between the Web server program and

other applications.

Such an intermediary is important, since few companies have their data stored in Web-readable form. A company might have its inventory data – say the specifications for 20,000 auto parts – stored in a large Oracle database. A WebObject can then be used to pass a search request from the server to the database, and return the matching records back to the server. These records then can be added onto a Web page to be viewed by a clerk, salesperson, or customer. True, this could be done today by writing programs known as scripts. But that custom process can be time-consuming; someone using the pre-fabricated building blocks of

WebObjects could build a complex Web site quickly.

While products such as NeXT's WebObjects or Art Technology Group's Dynamo make the Web server smarter, Apple Computer Co. is working on the other side of the equation: the client. The purpose of Apple's Cyberdog, which should be in beta early in 1996, is to make every application "Web-enabled." Now the only applications you can use on the Web are special browsers such as Netscape's. If you want to include a Web document in a report, you must copy it from the browser and paste it into your word processor. But with Cyberdog, you will be able to include an active link so that the copied informa-

tion remains current. Gina Clark, a product-line manager at Apple, envisions a situation in which a student writing a report on earthquakes might include a link to updated seismographic data at CalTech.

What makes Cyberdog so powerful (and, paradoxically, what may doom it to the scrap heap) is that it's based on OpenDoc – a software standard that allows a document to include data objects from many different applications. In this context, an object might be a chart, a table, or a short movie. Click on a table in an OpenDoc word processor, and it will launch the spreadsheet program that originally created the table, provided the

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better than what you can buy.

Our company decided that people are going to layer stuff above this very simple Web server to help others build Web applications, which is where the bottleneck is right now. There's some real opportunity there for making major contributions and a lot of money. That's what WebObjects is all about.

What other opportunities are out there?

Who do you think will be the main beneficiary of the Web? Who wins the most?

People who have something -

To sell!

To share.

To sell!

You mean publishing?

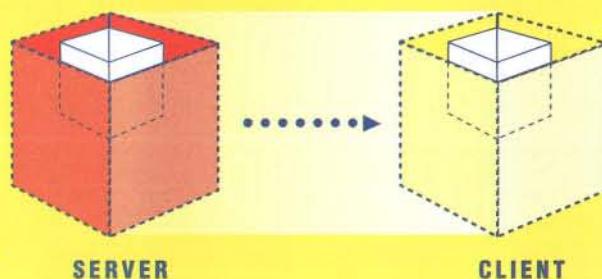
It's more than publishing. It's commerce. People are going to stop going to a lot of stores. And they're going to buy stuff over the Web!

What about the Web as the great democratizer?

If you look at things I've done in my life, they have an element of democratizing. The Web is an incredible democratizer. A small company can look as large as a

Think of the development of Web objects as falling into three stages, which represent higher levels of complexity and interaction across the Web. These stages are not chronological - products are being developed in all three.

Stage One: Both the Web server and the client become smarter in their own right. Web objects on the server side help make links to internal databases and spreadsheets that allow for more complex publishing. For clients, objects help make all applications - not just browsers - able to reach out to the Web. But the server and client still operate on either side of a divide.



program can be found on the hard drive. Cyberdog just defines a new kind of OpenDoc object; in this case, a Web page.

Unfortunately, OpenDoc is something of a sinking ship. Developers are moving away from OpenDoc and toward OLE, object linking and embedding, a competing standard backed by Microsoft. Aside from the Microsoft factor, this migration doesn't make a lot of sense to many analysts. After all, OpenDoc is not only technically superior to OLE, it's even compatible with OLE. Then again, Microsoft's market dominance has the power to cloud developers' minds.

That same effect surrounds Microsoft's Web technology,

Internet Studio, formerly known as Blackbird. The name change mirrors Microsoft's frequently shifting Internet strategy. Like Cyberdog but using OLE instead of OpenDoc, Internet Studio helps tie together desktop applications and the Web. But Internet Studio goes further: it allows small programs to be sent from the server to run on the client, making it representative of the second stage in animating the Web. Unfortunately, Internet Studio also illustrates the perils as much as the possibilities.

A potential use of Internet Studio goes like this: you click on a Web link to download a movie. Because you don't have the program nec-

big company and be as accessible as a big company on the Web. Big companies spend hundreds of millions of dollars building their distribution channels. And the Web is going to completely neutralize that advantage. **What will the economic landscape look like after that democratic process has gone through another cycle?** The Web is not going to change the world, certainly not in the next 10 years. It's going to augment the world. And once you're in this Web-augmented space, you're going to see that democratization takes place.

The Web's not going to capture everybody. If the Web got up to 10 percent of the goods and services in this country, it would be phenomenal. I think it'll go much higher than that. Eventually, it will become a huge part of the economy.

RETHINKING REVOLUTION

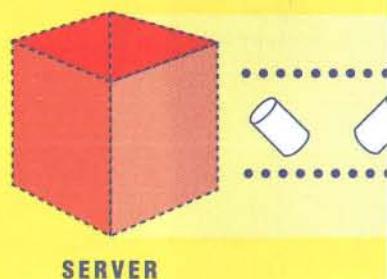
What's the biggest surprise this technology will deliver?

The problem is I'm older now, I'm 40 years old, and this stuff doesn't change the world. It really doesn't.

That's going to break people's hearts.

I'm sorry, it's true. Having children really changes your

Stage Two: The server begins sending small applications, or applets, to the clients rather than simply text or data. This sending of computer programs, or code, across the Web greatly increases the level of interaction, allowing new forms of animation and 3-D experiences, such as taking a walk through a planned building. Still, the direction of the client-server interaction is decidedly one-way.



essary to view the movie, the Web server first sends you a small applet program known as an OLE control (sometimes referred to as an OCX). This immediately starts running on your computer and begins displaying the movie during the download.

With these kinds of applets, your browser will never be out of date. If new data objects such as animations or sound files become popular, your browser will still be able to support them with the right OLE control.

But there's a more ominous scenario: you click on a Web link to download a movie, and instead you end up with a virus that erases your hard drive. Greg Leake, product manager for Internet Studio,

admits this is a concern. But he argues that people take the same risk whenever they buy a program at the local Egghead. Of course, the difference is that Egghead carries the products of a few trusted publishers like Microsoft, while the Web carries the output of a few million.

Fortunately, there's a better solution from Sun Microsystems. Java, its language for programming the Web (see "The Java Saga," *Wired* 3.12, page 166), has been carefully designed to prevent anyone from wreaking havoc on a client computer. It's a bit like a cat that's been declawed so it won't wreck the furniture. Unlike standard languages such as

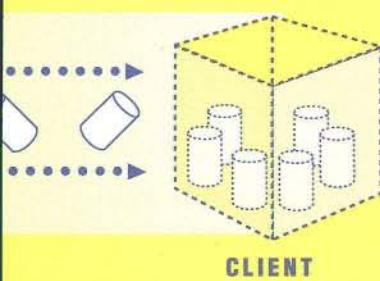
view on these things. We're born, we live for a brief instant, and we die. It's been happening for a long time. Technology is not changing it much – if at all.

These technologies can make life easier, can let us touch people we might not otherwise. You may have a child with a birth defect and be able to get in touch with other parents and support groups, get medical information, the latest experimental drugs. These things can profoundly influence life. I'm not down-playing that. But it's a disservice to constantly put things in this radical new light – that it's going to change everything. Things don't have to change the world to be important.

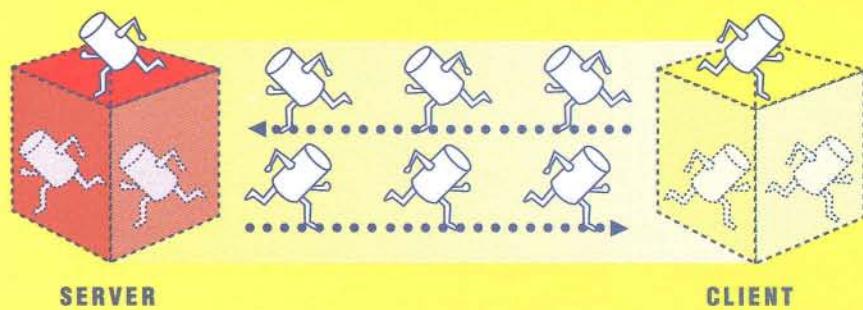
The Web is going to be very important. Is it going to be a life-changing event for millions of people? No. I mean, maybe. But it's not an assured Yes at this point. And it'll probably creep up on people.

It's certainly not going to be like the first time somebody saw a television. It's certainly not going to be as profound as when someone in Nebraska first heard a radio broadcast. It's not going to be *that* profound.

Then how will the Web impact our society?



Stage Three: Both client and server send applets back and forth, and some of those applets may live partly on the Net. The client might send the server a little program that initiates a customized database search, for example. This environment of full two-way interaction looks more like a lively world of digital agents than the static world of the Web today.



C, Java does not allow the programmer to poke around arbitrary locations in memory. And Java has other advantages as well. For one, Java can run on any kind of computer, while OLE controls currently work only on computers that use an Intel processor and run Windows. Two, Microsoft recently licensed Java and pledged some support, though the company doesn't appear to be making Java a core component of its Internet strategy. Finally, Java applets can be sent to the server, not just to the client.

It's an important distinction, because this blurring of client and server is what will allow the vital great leap forward into the third stage

of animating the Web. Programs that travel the Web will start to look more like agents – small bits of autonomous code sent out to do a user's bidding. Indeed, General Magic Inc., which originally imagined a world based around PDAs and agents, is retargeting its Telescript language for the Web.

In other words, chalk Telescript up as one more competitor in the race to animate the Web through object technology. Although the Web isn't ready for the third stage yet, in another year we may well see Telescript go head to head with Java. Because Telescript was designed with agents in mind, it offers significant technical advantages

We live in an information economy, but I don't believe we live in an information *society*. People are thinking less than they used to. It's primarily because of television. People are reading less and they're certainly thinking less. So, I don't see most people using the Web to get more information. We're already in information overload. No matter how much information the Web can dish out, most people get far more information than they can assimilate anyway.

The problem is television?

When you're young, you look at television and think, There's a conspiracy. The networks have conspired to dumb us down. But when you get a little older, you realize that's not true. The networks are in business to give people exactly what they want. That's a far more depressing thought. Conspiracy is optimistic! You can shoot the bastards! We can have a revolution! But the networks are really in business to give people what they want. It's the truth.

So Steve Jobs is telling us things are going to continue to get worse.

They are getting worse! Everybody knows that 158 ►

over Java. Most important, Telescript programs can retain items in memory as they travel from computer to computer, while Java programs forget everything when they move to a new computer. The question is whether General Magic is willing to make Telescript an open standard, as Sun did with Java.

When I spoke with Jim White, a vice president at General Magic and the father of Telescript, he summed up the importance of animating the Web. "Right now, the Web is passive," he said. "You derive benefit only in relation to the amount of time you spend searching." In short, people are doing all the work. Only when we put machines

into the loop and use computer power to filter and search for information, will the Web truly begin to transform our lives.

Of course, reaching that point will take time. In the next six months, smarter servers and clients will allow us to take the first steps. This is where NeXT's WebObjects fits in, though by itself it's not terribly important. The market for Web server tools will be very competitive, and it's unlikely that NeXT will be able to compete in such a low-margin business. Besides, this first stage of animating the Web is merely an incremental improvement, rather than the revolutionary change promised by tools like Java. ■ ■ ■

Way New Leftists

Arthur and Marilouise Kroker believe
the new "virtual class" is exploiting
the neo-proletariat "surplus flesh."

By Jean-Hugues Roy

Wired: "Digital flesh" – is this a metaphor, or do you mean actual flesh?

Arthur Kroker: Well, when I look at you, I see digital flesh. All your digital orifices are right here – your tape recorder, your digital camera. They transcribe your perception into your flesh. They've probably rewired your perspective already. Maybe you've got a Photoshop imagination, or cut-and-paste relationships.

But isn't that digital culture rather than digital flesh?

AK: There's more. What happens when Internet culture meets recombinant genetics? Someday, intelligent agents are going to need bodies. Why should they settle for pixelated bodies? The end of the 20th century marks a convergence among recombinant genetics, Net culture, and artificial intelligence. It's the end of the human species.

Technology is in the hands of people who want to use it for narrow purposes: commercialization and control. The consequences could be tremendous.

In your previous book, *Data Trash*, co-authored with political philosopher Michael Weinstein, you say chips could be implanted in our flesh. Isn't that far-fetched?

Marilouise Kroker: It's already happening with animals. Our daughter, who lives in Toronto, was given a kitten the other day with a chip in its neck. It contains her name and the health history of the cat.

AK: Now, who wouldn't like to have the choice, after giving birth, to have a chip implanted in the baby, with his or her name, yours, and vital medical information?

It could even help people locate their children!

AK: Exactly! What parent wouldn't like that?

But don't you see a huge wave of protest should politicians dare to suggest such a measure?

MK: Well, in the US, single mothers on welfare are portrayed by the right wing as a terrible burden on public finances. People won't protest if implanting chips in their babies could somehow help reduce that burden.

AK: Call it health fascism.

Where could ideas like that pop up?

AK: I can't think of one country that doesn't have a retrofascist movement. Canada has the Reform Party. France has Jean-Marie Le Pen. Russia has Vladimir Zhirinovsky. And the US has Newt Gingrich.

Tech hype began with the Tofflers and others presenting a utopian perspective on technology. But then, with Gingrich, you suddenly have a movement in which tech hype associates itself with conservative fundamentalist movements. Think of *Wired*'s cover with Newt – "Friend and Foe" ... but mostly buddy!

What's wrong with Gingrich? He pushes for digital democracy.

AK: There are significant differences between our

perspective and Gingrich's. He wants to break down any notion of democracy based on collective discussion. His is in fact a push-button democracy: 53 percent of people want Congress to do this? Adopted. Power to the pollsters! That's the *antithesis* of digital democracy. **Historically, change has been triggered by demonstrations in the streets, by armed rebellion. How can power express itself digitally?**

AK: First, maybe it's a mistake to think of unitary social movements as we have in the past. It leads to a very totalitarian perspective. Second, a different form of politics, particular to third-millennium culture, is taking shape. It is much more polymorphous and ambivalent in character. And on the Net, a lot of interesting politics are happening. Take the movement of solidarity toward Sarajevo, for example. Sarajevo is today's Spanish Civil War.

But is this digital solidarity effective? The Zapatistas put press releases on the Net, yet it didn't change much at ground level.

AK: How can people outside Mexico really intervene decisively against the Mexican government's fascist policies of extermination? This is the peculiarity of life in the '90s. At the same time digital media encourage a global consciousness, parts of the world recede into darkness.

So wired culture doesn't change things much, does it?

AK: Why should it? There are limits to wired culture, and one of its properties is that in many ways it turns its back on surplus flesh.

MK: Yet as our world changes, if you want to critique it, you have to keep up with it. Antitech people will say, "I don't watch television because it's bad." Well, how can you analyze your culture if you don't watch TV? It's the same thing for what's going on digitally right now.

If Karl Marx were living today, what would he say?

AK: The three volumes of *Das Kapital* give an amazingly accurate critique of contemporary conditions. Yet we're not pushing a theory of class dialectics. Our Marx has Nietzsche looking over his shoulder all the time!

Rebellions of surplus flesh are something I'd certainly support. But I also notice that many members of the virtual class have deep feelings of anxiety and ambivalence about projects they're involved in. Unlike Marx's bourgeoisie, the virtual class experiences huge contradictions. Just between the coders and the businessmen, there are conflicts. There's resistance even within the virtual class. Its hegemony won't last. ■ ■ ■

A "virtual class" has taken over the digital realm, say Arthur and Marilouise Kroker. It is a high-tech post-bourgeoisie so obsessed with technology it's about to spawn a new species – a melding of machines and humans the Kakers call "digital flesh." To succeed, the virtual class must rely on the exploitation of a neo-proletariat – "surplus flesh."

Sound familiar? The BBC calls Arthur Kroker a '90s McLuhan, but he's more like a 21st-century Marx.

In an upcoming book and CD, *Hacking the Future* (St. Martin's Press), the Kakers interweave hard theory with elements of fiction in a new take on cyberpolitics. Arthur, a political scientist at Concordia University in Montreal, and Marilouise, a writer, speak in playful terms that are hard to decrypt, but underneath the puns is a complex remapping of Marx's class system.

BANGA

East emphatically meets West
on congested Mahatma Gandhi Road,
the heart of India's software industry.



IT'S BEEN CALLED THE SILICON VALLEY OF INDIA.
BUT DOES IT REALLY HAVE THE ENTREPRENEURIALISM AND CREATIVITY OF ITS NAMESAKE,
OR IS IT DESTINED TO REMAIN THE LOW-COST SUPPLIER TO

AIORA

HANDICRAFTS



WESTERN TECHNOLOGY GIANTS? BY RICHARD RAPAPORT

PHOTOGRAPHS BY RAGHU RAI

It was here ... that the East began: in this chaos of uneconomical movement, the self-stimulating din, the sudden feeling of insecurity, the conviction that all men were not brothers and that luggage was in danger. – V. S. Naipaul, *An Area of Darkness*

It is raining in Bangalore. For a few hours at least, the normally poisonous air clears in this south-central, high-plains Indian town of 5 million. The capital of Karnataka state, Bangalore long enjoyed renown as the garden spot of India – an affable, leisurely place celebrated for sweet breezes, cool summers, tree-lined boulevards, honey-mooners, and retirees.

No more.

Over the last quarter century, as hundreds of corporations have

Rao and I are out tonight, undaunted by the monsoon, indulging in Bangalore's second favorite activity after software porting and patching: pubbing. Indeed, one of Bangalore's charms is the nightly cruise among the hundred-odd bars around Mahatma Gandhi Road in Bangalore's crowded central district, Shivaji Nagar. Almost every night in establishments like Pub One, Knockout, Sonia Green's Thumbs Up, Pubworld, and NASA, the young guns of India's software industry gather, drink beer, groove to Hindi disco, and, naturally, talk computers.

As employer of 1,100 software engineers at Wipro Systems, the 40ish Rao takes a cool, professional interest in the scores of young men who crowd into NASA (there are conspicuously

rettes and eating chili-fried peanuts than on buying beer. Alcohol is expensive – a beer costs about 35 rupees (US\$1) – and while the typical monthly starting salary of Re10,500 (US\$300) for software writers is generous by Indian standards, it buys increasingly less in increasingly costly Bangalore.

That Indian professionals will work for so little, with starting salaries four and five times lower than those of their American counterparts, has given the Indian software industry its initial boost. But as costs and salaries in Bangalore escalate, the old calculus is changing. For the time being, however, the fanatical devotion of Bangalore's IT writers – "They chain themselves to their computers," says one industry local – keeps them going.

"shopping" employment agencies is offering the highest-paying contracts for highly prized software jobs in the US, which come with the bonus of a US Immigration and Naturalization Service green card.

But the hottest Church Street buzz tonight concerns Infosys, India's fifth largest software exporter and the most "American" of Bangalore's home-grown software houses; its new suburban campus, workout facility, and stock options rival those of Seattle or Silicon Valley. Infosys has just lost an important contract with General Electric, and speculation surfaces about what this bodes for the future of Bangalore's "progressives."

"In the last few months, there's been a lot of stress at Infosys," Rao tells me over the din,

"ALL YOU HAVE TO DO IS TAKE COFFEE IN A LOCAL CANTEEN TO GET A SOFTWARE JOB," SAYS ONE EXECUTIVE ABOUT INDIA'S NEW, SILICON VALLEY-STYLE MOBILITY.

moved in to take advantage of Bangalore's temperate and dust-free climate, cheap housing, and work force educated in information technology (or IT, the popular shorthand here), economic growth has bred a new set of woes. In that time, the city has quadrupled in size, real estate prices have quintupled, and a once gracious metropolis has begun to choke on its own pollution and gridlock.

Not that anyone particularly seems to notice. Certainly not here tonight at the NASA pub, where I am sitting drinking India's best Kingfisher Beer with Ayyagari Lakshmana Rao, technical vice president of Wipro Systems Ltd., a division of Wipro Information Technology Group – India's second largest information technology company and a leader in Bangalore's explosive software-writing industry.

few women about, the sexes still being highly segregated in India). The Church Street establishment is one of Bangalore's pubs du jour, though NASA is more like a Disney ride than a bar: it has a futuristic, neon-lit, duralumin-and-black-plastic *Star Wars* interior; its walls are perforated with portholes containing photos of astronauts and spacecraft; each table comes equipped with its own nose-cone-shaped ashtray.

Beverly Hills 90210 is on Star TV while waiters dressed like United Airlines pilots pass with amiable impatience among the "freshers," or barely postpubescent IT workers. The staff want guests to imbibe, while the guests want to stretch their drinks as far as possible. The dark young men, dressed in slacks and floral shirts, many sporting the wispy mustaches of early manhood, seem more intent on smoking ciga-

Even during leisure hours in the pubs on Church Street, IT is the obsession. So many of Bangalore's software houses, pubs, and canteens are located on Church Street, an alley running parallel to Mahatma Gandhi Road (or MG Road, as it is locally known), that the Bangalore industry gossip has acquired its own handle: the Church Street buzz.

This never-ending buzz focuses on escalating salaries at local IT leaders such as Wipro, Tata, Satyam, and Infosys. Talk swirls about Bangalore's expanding multinationals – Texas Instruments, Novell, Hewlett-Packard, Citicorp, and others. Juicy tales abound about how Sun Microsystems just made off with half a dozen IBM/Tata executives in the process of opening new offices in town. Then there are the details concerning which of Bangalore's notorious "body-

explaining how the lost business and long commute to its location outside Bangalore has sent 120 software writers looking for jobs. Most were instantly snapped up by other local software houses hungry for bodies in a frenzied market that seems to bring in new assignments from overseas each and every day.

Over an Annie Lennox tune, Rao describes the employment merry-go-round within Bangalore's IT companies. Rao agrees with another executive who suggests that "all you have to do is take coffee in a Church Street canteen to get a new software job." This is a new, unsettling phenomenon for India; Silicon Valley-style upward mobility is

Richard Rapaport would like to put together a group of investors to build a low-cost PC for India. He can be reached at rjrap@aol.com.



Nandan Nilekani (left, above) founded Infosys, a more sprawling, American-style company than Wipro, with its bustling offices (right) off Mahatma Gandhi Road.

At the NASA pub, IT is the obsession.

Baysoft's Joe Vithayathil (second from right) catches up on "the Church Street buzz."

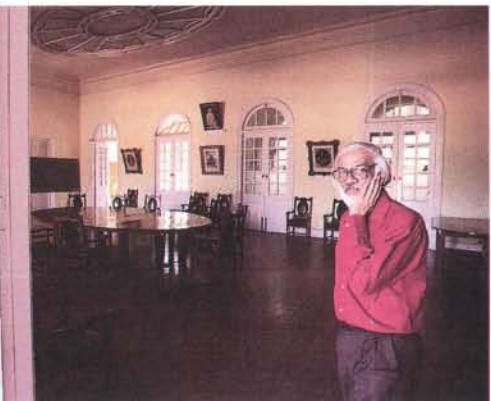
shocking to old-line Indian executives brought up in the tradition of nearly feudal loyalty to employers. But it is the taste of free enterprise that endows Bangalore pub life with the tang of modernity and a thrilling sense of being on the technological event horizon.

Underneath it all, however, runs a darker current. Increasingly, questions float about the fundamental viability of Bangalore as the center of Indian IT, let alone as a world leader. Yes, certainly, Bangalore is being painted, in countless news stories, as "India's software Silicon Valley." But is Bangalore, and indeed all of Indian IT, reaching the inevitable limits of growth? Can

technosersfs, the workers are paid low salaries – by American standards – and bound to the body-shoppers by contract.

Bodyshopping is the huge, hidden, and largely denied factor in India's IT successes. One Indian software executive conservatively estimates that Indian workers shopped to companies in America account for at least one-fourth of the Re29 billion (US\$825 million) earned from software in the 1994-1995 fiscal year. (NASSCOM, India's semi-official software association, puts the total revenues of India's IT industry during the same period at Re77.4 billion – US\$2.2 billion.)

Such numbers, of course, are tiny by US standards. Computer



Professor Govindarajan Padmanaban, of the Indian Institute of Science, welcomes comparisons with Stanford, though his school lacks the full computer bona fides.

Indian software, which up until now has competed solely on low price, create the kind of added value, creativity, and brand identity without which – many Indian IT executives agree – some other, hungrier Third World metropolis will snatch the software brass ring?

Church Street even suggests that despite all the brave talk about lucrative, state-of-the-art client-server projects, the big software companies remain mired in coding ancient languages like Cobol for legacy systems that are three decades old. And they marginalize themselves by sending the best and brightest native sons and daughters to work for overseas software companies. Like indentured

Associates, for example, America's largest business software supplier, did \$2.6 billion alone in 1995. And while software is one of the leading exports in this, the early spring of India's new capitalist era, many question whether it has reached a self-sustaining critical mass.

Thus, in the pubs on Church Street, there is a sense that a major breakup may be coming. The ultimate question, heard even over the amplified rock and roll, is this: Are pockets of sustaining creativity being established that are capable of raising Bangalore out of the bargain basement of software porting and patching and elevating it to the next critical level of IT accomplishment?

My first meeting with Rao, at Wipro's development center off smoggy and bustling MG Road, had been more guarded and formal than our subsequent pub crawl. Wipro is lodged in a peeling seven-story building, set haphazardly off a dirt alley and fronted by a disarray of motorbikes, the vehicle of choice for young Bangalore professionals. The noise and blue smoke from diesel buses and motorized rickshaws hangs in the air as I climb the dingy stairwell up to Rao's fifth-floor office.

In a business continuum that begins with old-line, rigidly hierarchical companies (like the giant Tata Information Systems) and extends to the newer, more American-style companies (like Infosys, Satyam, and Baysoft), Wipro Systems is a middle-of-the-road Bangalore company. Neither too feudalistic nor too avant-garde, Wipro – with Re774 million (US\$22 million) in fiscal 1994 software sales – is an enterprise that would rather borrow money from a bank than issue stock. According to one former executive, it's a company that "gives its managers autonomy, but not in terms of sharing ownership or challenging them to grow the company." In other words, it is a central place to at least try to understand the future of the software industry in Bangalore.

While dozens of young Indian men and women huddle over PCs outside his office, the wiry, often-wry Rao recites a Wipro-centric history of technology in Bangalore. His tale begins, as do most such recitations, I soon learn, with the story of how the area's gentle climate and hydroelectric capacity led Indian industrialist Jamsetji Nasarwanji Tata to decree that a science and technology university be built on a 372-acre site in northwestern

Bangalore. Founded in 1909, the institute is known today as the Indian Institute of Science. It is India's most important technical school; its graduates are the Brahmins of Indian science.

Educated in preparatory schools all over India, the cream of the Indian technical crop tended to like life in Bangalore, and many chose to stay. With independence in 1947, defense, electronics, and civil organizations were founded and, logically, located in Bangalore: Hindustan Aeronautics, the Indian Space Research Organization, the National Aeronautical Laboratory. These organizations, with the thousands of engineers and scientists who came to serve them, made Bangalore a natural center for Indian technology.

In 1977, under the misguided notion that it would encourage domestic industry, India's socialist government limited foreign investment and demanded that companies such as Coca-Cola and IBM share their trade secrets and best technology. At a critical moment, India's then-Prime Minister Morarji Desai was reported to have challenged a top IBM executive: "Is IBM smarter or is India smarter?" The executive's exact response is lost to history. His company's response was not: IBM politely, firmly, left India.

The result? "A gap," says Rao. "An absence of any indigenous computer manufacturing."

Rao, who was then working on mainframe computers, recalls how he and others helped design small Indian-built micros as a stopgap replacement for what soon became hopelessly out-of-date IBM and DEC machines. These Indian computers were so primitive, Rao remembers, they used Basic – "not even Cobol."

Ironically, as the Indian computer industry limped along through the early 1980s, the isolation led to unforeseen

100

JOH ENSCHEDE EN ZONEN IMP

WIL ANDERE DAK-VOORZIENINGEN
DAN HET STANDAARD ALLES WAT TRAPPET EN SLIJPT DOOR DE NACHT. GEVULDLOS AANWIJKEN IN DONSZACHTE VLEUGELS.
C. SUDENIN 'DE WIE' LIDAT. WIL HET BEZOEK AFSCHEU NEMEN ? FEN REIZIGEREN ?
DE STEENUIL IN HET WATERMERK HEFT LICHTE EN DONKERE TINTEN.

TEGEN HET LICHT VORMEN PRECIES PASSENDE DELEN EEN MUIS
DE TEKST BOVEN HET WATERMERK IS LEESBAAR DOOR EEN VERGRO
DE INKTLAAG OP DE VOORKANT IS VOELBAAR
DE STEENUIL IN HET WATERMERK HEFT LICHTE EN DONKERE TINTEN.

THE COLOR OF MONEY

There's poetry in Dutch money – and you should take that literally. ▶



Several of the Netherlands's more recent bank notes, including the 100-guilder bill (worth US\$65), feature a few lines from late Dutch bards, such as Bud-dingh' or Slauerhoff.

But there's poetry in the look

of Dutch money, too. The country that brought you Mondrian and *De Stijl* now issues bank notes that stand out among the world's printed currency, in part because of their abstract forms. Designer Jaap Drupsteen decid-

ed to break with the tradition of putting a statesman or famous artist on one side of the note. "What if we discover 20 years from now that the person was a good-for-nothing?" he muses. Instead, his geometric, minutely

ornamented images position a centuries-old art form squarely on the cusp of a new millennium.

Drupsteen is quick to point

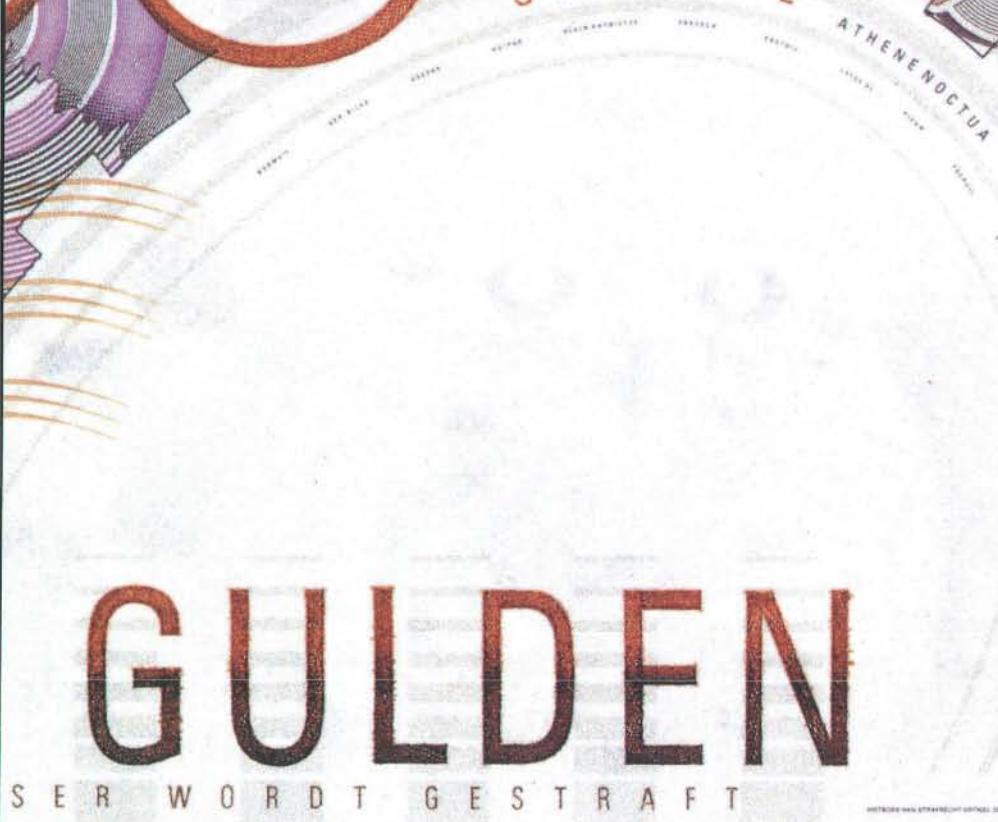
Rogier van Bakel (rogiernl@aol.com) writes regularly for *Wired*.

DSCHE BANK

9 JANUARI 1992

PRESIDENT

1000
STEENUIL



GULDEN

SER WORDT GESTRAFT

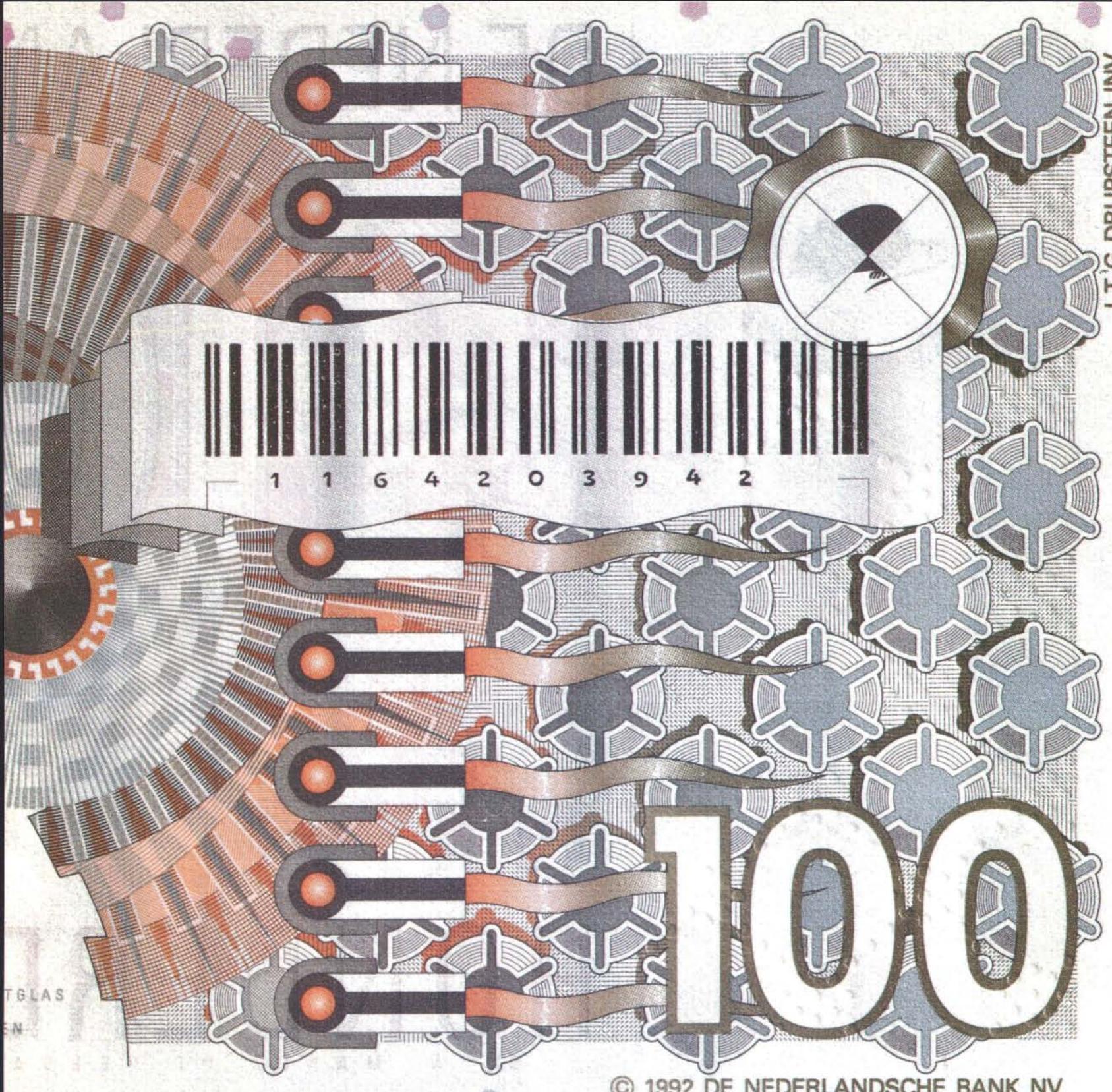
out, however, that aesthetics aren't everything. Bank notes have to be user-friendly. "You should be able to recognize the denomination at a glance by the color and density of the graphic structure." You should also be

able to stop miscreants from photocopying the money. Enhanced by shiny inks and mother-of-pearl accents that look like so much confetti, the bills can't be reproduced by even the best color copiers.

Sophisticated forgers have also been deterred. Since the bill's introduction in 1993, not one convincing counterfeit note has been discovered.

Drupsteen awaits the launch of the crowning work in his

series: a new 1,000-guilder bill (worth US\$650). Ironically, it may signal the beginning of the end for Dutch money, thanks to the economic unification of Europe. The guilder, as with most proprietary European cur-



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encies, is likely to disappear in 2002, to be replaced by the euro (or is it ecu, thaler, or florin? – the naming jury is still out).

When asked if he hates to see the guilder – and part of his life's work – vanish, Drupsteen is

philosophical. "Do I hate to see apartment buildings where there used to be farms? Do I hate to see forests scarred by highways? I suppose I'll get used to it. *Pantha rei.*" Everything flows. – Rogier van Bakel



Residents of the Dutch city of Arnhem are using the next iteration of Dutch currency: e-cash. The "Chipknips," issued by the Postbank, one of the country's largest, can carry up to 500 guilders and be used as cash at banks, post offices, supermarkets, and stores. National rollout is scheduled for this year.

Tsutomu Shimomura with John Markoff

Illustrations by Gregory Nemec

CATCHING KEVIN

Legendary dark-side cracker Kevin Mitnick had violated one computer too many — superhacker Tsutomu Shimomura's.

The exclusive story of the last hours of Shimomura's quest for personal justice, as he closes the trap on his prey.

Kevin Mitnick was a nuisance. For more than 15 years, he broke into computers, looked around, stole things, and then broke into yet more computers. He did little major damage, but his constant visitations became harassing – especially if you tried to catch him. Then he would screw up your phone service, or your private mail, or your credit records, or even your job. Although he was arrested five times for his digital trespassing, Mitnick wouldn't stop.

Mitnick's obsessive breaking and entering made him a legend – both in the underground of hackerdom and in the headlines of The New York Times. Part of the fascination with Mitnick resides in his uncanny ability to hack any system. From a military computer to FBI and DMV records, Mitnick could weasel his way into nearly any network's core. Yet by almost every account, Mitnick, who is now 32, was technically dull – he achieved most of his conquests through superb social engineering, imitating a lineman's jargon, impersonating a superior, sifting through trash, conning unsuspecting employees out of their field manuals, exploiting his knowledge of a phone company's organizational chart.

But Mitnick was no Luddite. Several years ago, he cleverly figured out that if he could hack cellular phones with the same ease as ordinary phones, he could start from a mobile handset and thread his labyrinthine way to any computer in the world, virtually untraceably. Since he didn't do code, he needed to find someone who did, someone who had custom, turbocharged cellular phone software, and then social-engineer the goods away from him or her. After several unsuccessful attempts to con code from some likely candidates, Mitnick eventually targeted Tsutomu Shimomura as the guy with the tools.

It was a bold move, because Shimomura was a respected security expert and a character almost as complex as Mitnick. A 30-year-old science geek, Shimomura was also a Japanese citizen, a ski bum, a longhaired computational physicist, and a hacker himself. But unlike Mitnick, every time Shimomura's explorations uncovered security holes, he reported them to security authorities, not to hackers.

So, in December 1994, when someone broke into Tsutomu Shimomura's elaborate computer system in his San Diego home using a never-before-seen, sophisticated hacking method and then stole some fancy cellular phone tools, Shimomura took it as a personal challenge. When the trail led to Mitnick, Shimomura became a cybersleuth, on a mission to catch Kevin.

Takedown: The Pursuit and Capture of America's Most Wanted Computer Outlaw – By the Man Who Did It is Shimomura's first-person account of the search, written with the help of New York Times reporter John Markoff. No stranger to Mitnick, Markoff co-authored the 1991 book *Cyberpunks: Outlaws and Hackers on the Computer Frontier*, which chronicled the adventures of Mitnick and two other hackers. In retaliation for all the attention, Markoff's own e-mail account was hacked by Mitnick.

Takedown's fairly technical narrative makes several things clear: the mobility of a wireless world will greatly complicate security issues and legalities. If your port into cyberspace – that no-place place – is itself constantly moving around in physical space, how do you maintain accountability with the rest of the world? The more important insight arising from the Shimo-

mura story is that, in the eyes of hackers and cops, everything on the Net is transparent. If there is a will, anything you write in e-mail, every conversation you have in chat, every touch you make with a Netscape link, can be read – unless it is heavily encrypted. This has always been true, but if you've had any doubts about the thin veneer of privacy on the Net, the battle between Shimomura and Mitnick makes it plain as day.

Past midnight in mid-February of 1995, I found myself on the phone, sitting in the San Jose, California, offices of Netcom On-Line Communications Services Inc., talking to a cellular telephone company technician in Raleigh, North Carolina.

Usually, I work as a research scientist at the San Diego Supercomputer Center, where I delve into problems in areas as diverse as computational physics and computer security, but in December of 1994, I was planning a ski-bum vacation I had wanted to take for a long time.

Unfortunately, it just didn't work out. On Christmas Day, someone broke into my computers over the Internet. The stolen data included my electronic mail, software for controlling cellular telephones, and a variety of Internet computer security tools. I had been preparing to leave the next day for the mountains, but instead I flew back to San Diego and over the course of the next several days pieced together how the attack had succeeded.

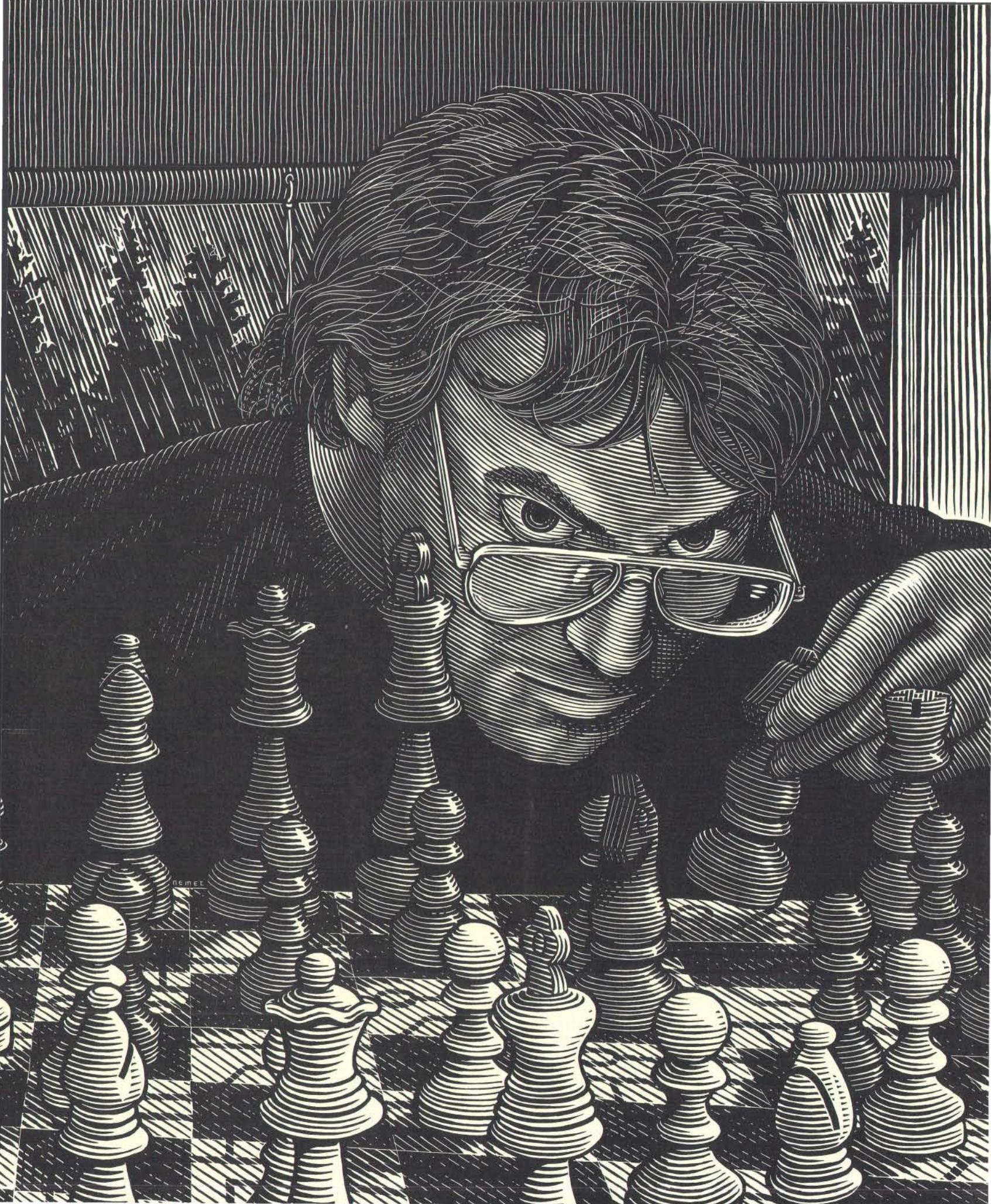
I patched the security holes in my network and headed back to the mountains. However, in late January, my stolen software was discovered, stashed in an infrequently used account on The Well, an online service based in Sausalito, California. Whoever had taken my software was still operating with impunity, using The Well as a staging base to launch forays into corporate computers at Motorola Inc., Apple Computer, Qualcomm Inc., and dozens of other computer systems all over the Net.

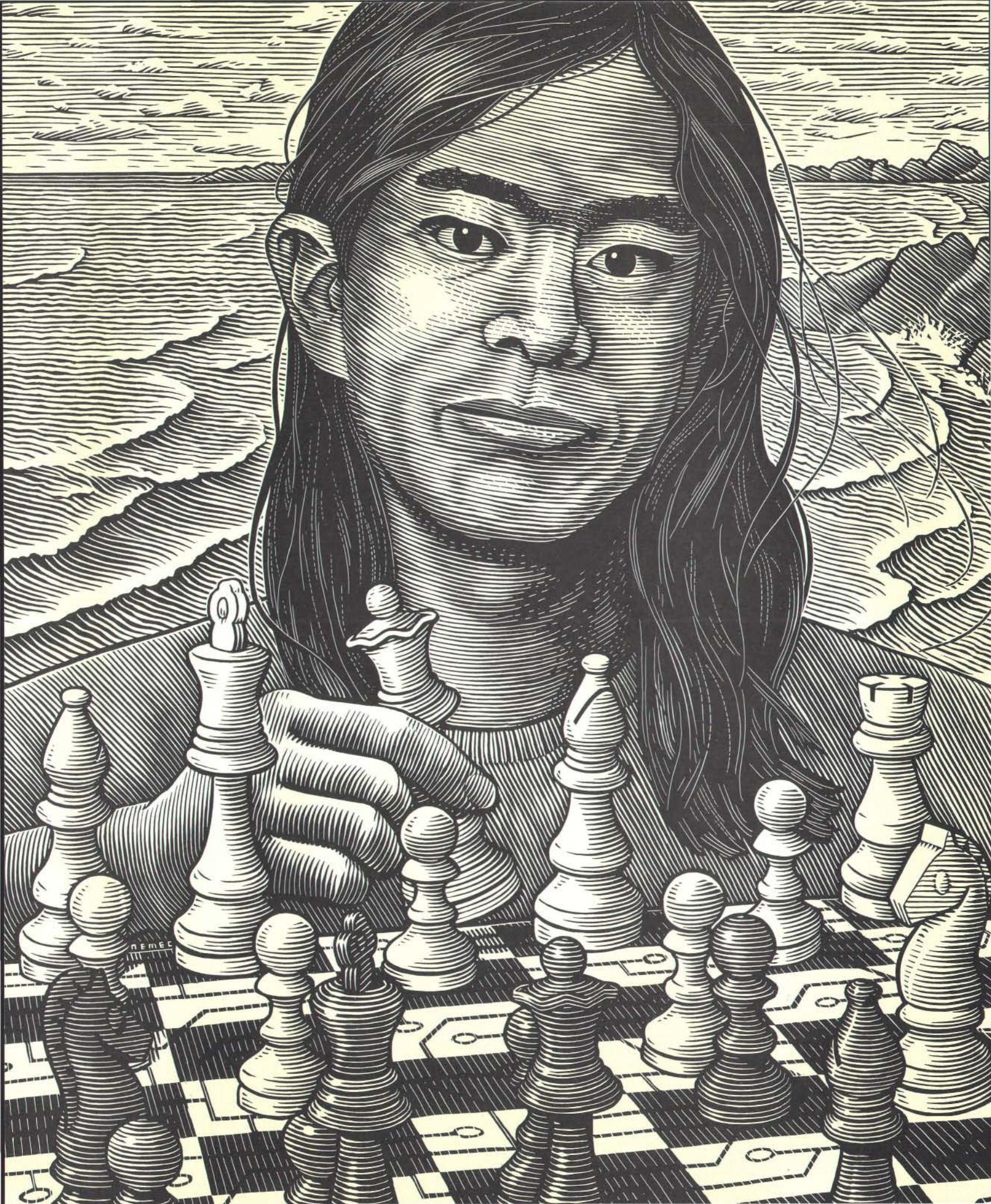
Skiing would have to wait. I decided to see if it was possible to track the intruder back through the Internet. The management of The Well invited me to assist them in determining how the attacker was breaking into their computers. Several days later, as I pursued the trail of the interloper, Netcom extended the same invitation. I arrived at The Well on Monday, February 6, and during the next week and a half was able to learn his identity and then lead the FBI to an apartment complex in Raleigh.

While I was tracking Kevin Mitnick, a series of hints had made it clear that he was using a cellular telephone and a modem in an effort to conceal his location.

Over the telephone, I explained to Sprint cellular technician Jim Murphy whom we thought we were dealing with, and that Kevin Mitnick had a 15-year history of tampering with telephone company switches. Murphy was incensed at the idea of someone messing with his switch, and as we talked, I learned that Murph, as he preferred to be called, was in fact very sharp. We immediately dropped into technical detail.

From Takedown: The Pursuit and Capture of America's Most Wanted Computer Outlaw – By the Man Who Did It, by Tsutomu Shimomura with John Markoff. Copyright © 1996 Tsutomu Shimomura and John Markoff. To be published by Hyperion. Check out <http://www.takedown.com>.





I began by asking him questions about the telephone switch the Sprint system was using. Telephone company switches are just computers with specialized operating systems. Often they have dial-up ports for remote diagnostics and maintenance. Frequently phone phreaks and members of the computer underground have used these ports as backdoors to tamper with the switches. They can get free phone calls or create chat lines anyone can dial into. The Sprint machine was a Motorola EMX 2500, in tandem with a DSC 630 switch, a device about which I knew nothing. I've had some experience with small telephone company and PBX switches, but not much with large central office switches like this. Murph gave me a tutorial on how his switch worked and what kind of data he had available. He had to be careful, because while we had a trap-and-trace warrant for calling records for one of the phone companies in Raleigh - GTE - the United States attorney had yet to prepare one for Sprint.

So Murph was limited in the kind of caller data he could offer me.

As we talked, Murph kept checking his switch to see if he could find anything obviously amiss or something that had been tampered with. While I waited on the other end of the line, he explored the innards of the computer, examining its translation tables while giving me a running commentary of what he was looking at. He said he had a theory that Mitnick might somehow have created a special number that would route his calls through the cellular switch and then on to the local dial-up number of Netcom. Every phone number has a direct route as well as an alternate route, and he wondered if one of the alternates had been messed with. He spent a long time probing his database to see if he could find any evidence of such a hidden route.

Nothing obvious showed up, however, and we began looking for alternative explanations. Murph had telephone calling records in a database that could be searched and sorted with many different parameters. However, each of these operations took up to half an hour.

We talked about useful ways to sort through the data, and then it occurred to me to ask, "What happens when I dial the GTE trace number?" I did so and heard this eerie "click-click, click-click, click-click," which continued, getting fainter and fainter until it disappeared and the call disconnected.

I came back on the telephone and described to Murph what I had heard. "My guess is you're hearing the call endlessly looping between the GTE switch and ours," he told me. "Eventually the power falls below a certain level, and the call is dropped."

I tried it again, and this time Murph monitored it from his switch. Again I could hear the "click-click" sound, but at the same time, I could hear the printer in his office register each time his cellular switch tried to set up a call. "Kerchunk. Kerchunk. Kerchunk."

"I'll be very surprised if he's tampered with our switch," Murph said. "We do have remote capabilities, but all remote accesses are logged. When Motorola, for example, connects to our switch, we first give them a password, monitor their activities, and then immediately change the password after the session ends."

"Let me try something else," I said. I dialed the phone number that was one number higher than our mysterious phone number. On the other end of the line, I heard the familiar warble of a fax

machine. Murph didn't see the call go through his switch this time. It made me even more suspicious of GTE. It told us that only one phone number in an entire block of phone lines had been routed to Sprint. Something was funny about that particular phone number.

"My guess is that the GTE switch has been hacked," I said. We continued to puzzle. He said he could start three simultaneous searches to try to find a match to the Netcom login information I had, because he had three terminals.

"Let's try a different strategy," I suggested. "How far back does your database go and what kinds of things can you search for?" He said he could go back as far as 3 p.m. on Thursday, February 9, and gave me a long list of sortable categories, including call start and end time, call duration, called number, and so on. Looking down my list of gkremen's logins - gkremen was a legitimate Netcom user whose account had been commandeered illegally - from different Netcom locations around the country, I saw that there were several long sessions.

"Can you search for calls of a duration of more than 35 minutes on Friday?" I asked. I had decided that while it might have been possible for Mitnick to conceal where he was calling from, it would be much more difficult to conceal the fact that a call was taking place. This was the beauty of traffic analysis. The second request I had for Murph was to search for all cellular telephone calls made to the range of numbers that were routed to Netcom Raleigh dial-in telephone numbers. Finally, I asked him to search for all cell phone calls to Netcom's Denver number.

Few people use cellular modems to transmit data, so any cellular call to a Netcom point of presence - the local telephone number in Raleigh - would be unusual. In any case, given that Netcom was a local call, a long-distance call to a dial-up number would be even more suspicious. In any case, if Mitnick had been making calls using the Sprint cellular system, we should have been able to find them here, even if GTE was unable to trace them.

Now I had my three questions. As he set up his computers, Murph said it was going to take a while to do the database search, so I told him I would ring him back in a while and hung up.

I settled in a vacant carrel with a still-functioning telephone. I called Murph back after about a half an hour to check on his searches. We started with the local calls to Netcom's Raleigh POP.

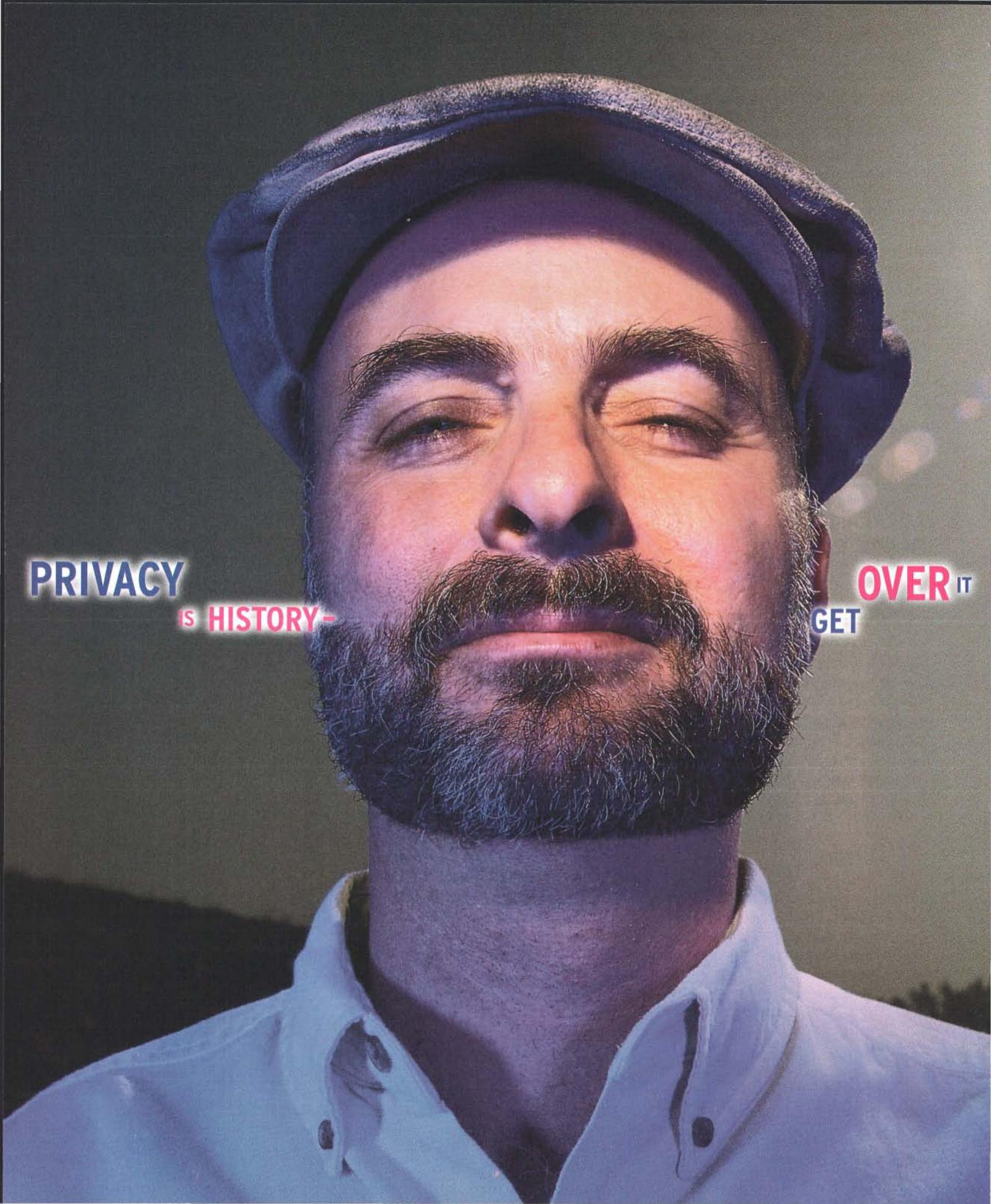
"I think I've seen that first number," he said.

"Good! Can you give me all the calls to the Raleigh POP?"

"I can't tell you the actual calling numbers because you don't have a warrant," he replied. "I can't give you the actual MIN-ESN pairs." The mobile identification number is the assigned cellular phone number and the ESN is the permanent serial number embedded in the phone.

"I don't want the number," I explained, and told him that I was trying to match calls to the sessions we had seen from the Netcom Raleigh dial-up. I was curious to see if there was a pattern to the calls that Mitnick might be making to Netcom through Sprint. If we were lucky, we might discover that all the calls came from a small number of MINs or from the same physical location.

We began playing a game that was a lot like the classic children's game Battleship. He couldn't tell me what the 172 ►



PRIVACY
IS HISTORY -

OVER IT
GET

Wired: In your introduction to *The Blinding Fog*, you project two disparate visions. One foresees police cameras on every lamppost. In the other, average citizens can access universal tools of surveillance. Is this our choice – Big Brother, or a world of Peeping Toms?

Brin: Make no mistake, the cameras are coming. Already a dozen British cities aim police TV down scores of city blocks. Crime goes down, but how long before those zoom lenses track faces, read credit card numbers, or eavesdrop on private conversations? You can't stop this Orwellian nightmare by passing laws. As Robert Heinlein said, the only thing privacy laws accomplish is to make the bugs smaller. In a decade, you'll never know the cameras are there. Those with access to them will have devastating advantages.

The only alternative is to give the birdlike power of sight to everybody. Make the inevitable cameras accessible so anyone can check traffic at First and Main, look for a lost kid, or supervise Officer McGillicuddy walking his beat. Only this way will the powerful have just as much – or little – privacy as the rest of us.

Members of the cypherpunk movement have been promoting encryption as a safeguard of personal privacy. But you don't buy it.

Foremost among reasons why encryption won't work is that secrecy has always favored the mighty. The rich

elevate the human condition. But most use it as simply another tool, a necessity of life. A routine miracle, like refrigerators and telephones. What intrigues me is how society's contrary interest groups might use infotech – first to mobilize, but then to argue, expose lies, and hold each other accountable. Mutually enforced accountability is the key to running a complex society that can no longer afford big mistakes.

What do you mean by mutual accountability?

In all history, humans found just one remedy against error – criticism. But criticism is painful. We hate receiving it, though we don't mind dishing it out. It's human nature. We've learned a hard lesson – no leader is ever wise enough to make decisions without scrutiny, commentary, and feedback. It so happens those are the very commodities the WorldNet will provide, in torrents. Try to picture multitudes of citizens, each with access to worldwide databases and the ability to make sophisticated models, each bent on disproving fallacies or exposing perceived mistakes. It's a formula for chaos or for innovative,

You'll find him in Grolier's *Multimedia Encyclopedia of Science Fiction*. Type keyword *Hard SF* for a hard-core subgenre that hews true to hard science. Enter *Brin, David*, and you'll learn that he is, with one possible exception (*Bear, Greg*), "the most important author of Hard SF to appear in the 1980s."

Brin, 45, is a space physicist and author of the bestselling *Uplift* series, which, says Grolier's, is "as compulsive reading as anything ever published in the genre." Brin's

THE ISSUE ISN'T PRIVACY, ACCORDING TO SCIENCE FICTION WRITER DAVID BRIN, IT'S EQUALITY OF EXPOSURE. BY SHELDON TEITELBAUM

will have resources to get around whatever pathetic barriers you or I erect, while privacy laws and codes will protect those at the top against us. The answer isn't more fog but more light: transparency. The kind that goes both ways.

You think privacy will become extinct?

Like the dodo. But there is a way to limit the damage. If any citizen can read the billionaire's tax return or the politician's bank statement, if no thug – or policeman – can ever be sure his actions are unobserved, if no government agency or corporate boardroom is safe from whistle-blowers, we'll have something precious to help make up for lost privacy: freedom.

You wrote *Earth* in 1988 before the Web became a media catch phrase. As a science fiction writer, where did you get it right? And wrong?

I thought *Earth* would get attention for the ecological speculations and such. Surprisingly, my depictions of a future infoweb raised the most interest. My WorldNet seemed to me a natural outgrowth of what people do with new technology. Some waste time. Others try to

exciting democracy – if people are mature enough.

There's been buzz comparing your 1985 novel, *The Postman*, to statements from the militia movement.

One of a writer's greatest satisfactions comes from inventing interesting villains. But the American mythos always preached suspicion of authority, a basically healthy social instinct that helped keep us free. But the message turns cancerous when it turns into solipsism – the notion that an individual's self-righteous roar has more value than being a member of a civilized society. Solipsism is a rising passion as we near the millennium. In countless popular books and films, the individual protagonist can do no wrong, but every institution is depicted as inherently corrupt. Yet, despite this pervasive propaganda, many resist the sweet lure of self-centeredness. Instead of rage, they offer argument, passion, criticism, even cooperation. *The Postman* was about choosing between solipsism and rebuilding a living community. We all choose each day, in less dramatic ways. ■ ■ ■

Startide Rising (1983), winner of the Hugo and Nebula awards, and his mainstream novel *The Postman* have been optioned for feature films. But aficionados of high tech and social change were most stirred by Brin's *Earth*, which predicted in 1988 how the World Wide Web would revolutionize the Net. Brin's first nonfiction effort, *The Blinding Fog: Privacy and Paranoia in the Information Age*, is near completion and will take an iconoclastic gander at the infobahn.

Sheldon Teitelbaum (shelit@aol.com) is a Los Angeles-based senior writer for The Jerusalem Report and a special correspondent for Sci Fi Universe.

The Information



**Smart cars running on smart highways
are but six years from prototype.**

By Joe Wiesenfelder

Illustration by James Porto

Superhighway

(This is not a metaphor.)

The first car I ever owned was a gold 1971 Oldsmobile Delta 88 – a leaded-gas-sucking, blue-smoke-belching hulk of a sedan. I was young. The car was not. I named her Golden Oldie.

Golden Oldie had plenty of quirks, but she never let me down. Friends teased me about anthropomorphizing my car, but I knew she was alive. After all, automobiles are greater than the sum of their parts.

They are mirrors of our own personalities, our homes away from home. Most important, they are symbols of our freedom. That's why, as I sat in a "smart car" at the New York Auto Show, I pressed the panic button, in more ways than one.

The panic button, represented by an icon of an ambulance, was part of Lincoln-Mercury's Remote Emergency Satellite Cellular Unit (RESCU), an on-board Mayday system that uses

global-positioning-system technology and a voice-activated cellular phone to help drivers in distress. To be introduced midyear as a factory-installed option on 1996 Lincoln Continentals, RESCU is based on the premise that traveling motorists might not be able to direct police or paramedics in the event of a crisis. When I pressed the button in the Lincoln's overhead console, the hands-free car phone automatically dialed the Westinghouse Emergency Response Center in Irving, Texas, and an operator's voice promptly asked me to describe the nature of my emergency. In this case, she knew it was just a drill. She also knew precisely where I was. That's when I really panicked.

The car, I later learned, wasn't under constant surveillance by a watchful eye in the sky - the cellular phone transmits the car's coordinates only when the panic button is pushed. But not all smart-car technology guarantees a similar degree of privacy. Ask people how the digital age will transform transportation, and some say that onboard computers will make cars safer, more comfortable, and more reliable than ever before. Others balk at the notion of granting any agency, public or private, the ability to determine their whereabouts. And, of course, there are people on the paranoid fringe who fear that in the 21st century, while millions of telecommuters sit at home in their underwear, riding high on the infobahn, the rest of us will be trapped on a government-run automated highway, a glorified Pirates of the Caribbean with Uncle Sam telling us where to go.

Reality probably lies somewhere in between. Cars manufactured today are already

much smarter than they were just five years ago. In some vehicles, embedded microcontrollers govern the ignition, transmission, suspension, antilock brakes, and numerous other subsystems. Localized data networks have relieved cars of pounds of discrete wiring. Side-view mirrors tilt downward so the driver can see the curb when the car is in reverse. Adjustable suspensions turn luxury sedans into sports cars at the touch of a dashboard button. Electronic brains in automatic transmissions use fuzzy logic to match drivetrain performance to the condition of the road and the driving style of the vehicle operator. All of these technologies now exist on production cars. And there's more of it to come.

Meanwhile, the federal government and private industry will be spending billions of dollars on research over the next several years, often struggling to adapt megabuck military technology for affordable smart cars and roads. The objective: to streamline traffic and virtually eliminate highway accidents.

To achieve these goals, fully automated vehicles may one day ask drivers to yield control to onboard computers and an automated highway management system - and thus to the government that runs it. Intelligent transportation systems, as they're called, are bound to change not simply the way we get from Point A to Point B, but also the way in which we interact with our vehicles and how we define our privacy rights.

But do we really need this stuff?

"Within this generation, we will add 50 percent more volume to our highways, and we can't add 50 percent more

capacity," says Christine Johnson, director of the US Department of Transportation's Joint Program Office for Intelligent Transportation Systems. "We can add only a few percent more capacity. Highways are still the Number One killer, and automobiles are a main source of pollution."

To find answers to these problems, the Federal Highway Administration and the National Highway Traffic Safety Administration have poured hundreds of millions of dollars into R&D to study Mayday systems like Lincoln-Mercury's RESCU, including fully automatic versions that summon emergency assistance instantly if a vehicle is involved in an accident. So-called dynamic guidance systems in Sweden and the UK transmit up-to-the-minute traffic information to onboard navigation units, allowing motorists to see congestion and construction warnings on their digital maps. These systems serve as models for test programs currently underway in urban centers across the US, most of which involve state departments of transportation, universities, and private corporations and seem to have forced acronyms like SWIFT and FAST-TRAC.

Most recently, the US Department of Transportation awarded US\$161 million to the National Automated Highway System Consortium, a General Motors-led alliance that will develop a prototype automated highway system by 2002. The goal, according to consortium literature, is to "provide fully automatic vehicle operation in dedicated lanes."

"The theory," says Johnson, "is that we can double or triple the number of automobiles within the same footprint and that we can bring accidents

down to - if not zero - then close to it."

Yet the idea of hands-off driving inspires near-hysteria among many automotive enthusiasts, who fear their cars will become little more than theme-park people movers. That, says Celeste Speier, the highway consortium's public affairs manager, will never happen. "The plan has never been, and I think I can safely say will never be, that all highways are going to be automated," she says. "People are going to have a choice as to whether they use the automated highway lanes."

Johnson suggests several potential configurations for an automated highway system. For example, a dedicated lane could be added on existing urban freeways, much like today's carpool lanes. Long, monotonous stretches of interstate in Nevada or Wyoming, on the other hand, might be ideal for automated guidance. Additional possibilities include bus lanes for high-density corridors. "You could instrument the lane and the buses as well as train the drivers so you're not just dealing with the random public," says Johnson. "We're never going to build another Lincoln Tunnel, despite what the Port Authority says. So, increasing traffic volume has a great deal of attractiveness."

Exactly how this automated highway system will take shape, technologically, is still up in the air. The project is in the earliest stages of investigation by core consortium members Bechtel Corporation, the California Department of Transportation, Carnegie Mellon University's Robotics Institute,

Joe Wiesenfelder (74563.1446 @compuserve.com) recently drove a very dumb moving van from New York to Chicago.

Delco Electronics, GM, Hughes Aircraft, Lockheed Martin, Parsons Brinckerhoff, and the University of California Partners for Advanced Transit and Highways (PATH). Most players agree that some degree of instrumentation will need to be installed in both vehicles and roadway surfaces to achieve full automation.

Jim Rillings, program manager of the highway consortium, says vehicles will probably require new communications systems and sensors as well as control gear tied into the steer-

within a lane, or "lane-follow." Several groups, including Mercedes-Benz, Carnegie Mellon, and GM, have demonstrated lane-following systems on existing "dumb" roads using video cameras and digital image processors – computers that use pattern recognition to follow the curves of the road. But these systems are expensive and have not reached 100 percent reliability, so the automated highway system will probably require a roadway infrastructure working in conjunction with onboard

Platooning refers to the ability to maintain following distance in a pack of vehicles. In theory, following distance within a platoon can be shorter than a single car length even at velocities exceeding highway speed limits. Collision avoidance is, as it sounds, the vehicle's ability to detect an object in its path and avoid hitting it. "It's not clear yet whether object avoidance will include steering or just braking," Rillings says. "It depends on the configuration of the roadway. Before you automatically steer a vehicle

ready for prime time, as I found out when I test-drove a Cadillac equipped with one of Delco's Forewarn systems.

Ross Olney, one of the developers, instructed me to follow a Lincoln driven by one of his colleagues. As I closed in on the other car, a yellow triangular road-hazard symbol suddenly appeared directly in my line of sight, reflected off the inside of my windshield, and I heard a series of loud chimes.

"Brake now?" I asked.

"No, that's your first warning," Olney said. "Wait."

The Lincoln was about five car lengths ahead of me when its brake lights came on.

"Brake now?" I pleaded.

"Wait."

A bright-red stop sign flashed before me. The car shouted, "Brake! Brake! Brake! Brake!" and then jolted hard, as if someone had spiked the brakes momentarily.

"Jeez!"

"Brake now," Olney stated, as the lead car throttled up and pulled away.

"Did you do that?" I asked.

"No," he said. "The car pulses the brake by itself to get your attention. We found that about 79 percent of all rear-end collisions are a result of driver inattention."

To combat this, the Cadillac's Forewarn system uses forward-looking radar to monitor the field ahead and a head-up display mounted on the dashboard to reflect warning symbols off the windshield. A rear-facing radar alerts the driver to objects below the trunk line when backing up. Another prototype system uses radar in the quarter panels to scan a vehicle's blind spots. If another car is present, visual indicators light up in the side-view mirrors, while an audible warning sounds if the turn

THE GOAL: triple the capacity, eliminate the accidents.

ing, brakes, and throttle. Data communications equipment – likely to be a two-way, radio-based digital system – will allow cars to "talk" with the automated highway control network and perhaps other vehicles. One possible scenario has roadway computers confirming that vehicles entering the dedicated lanes are equipped for automated travel, while onboard diagnostic equipment ensures that all the vehicle's systems are functioning properly.

Critical to the success of an automated highway is the ability of cars to steer themselves

sensors. Most promising thus far are systems that use magnetic markers installed along the center or edges of lanes. Magnetic nails are one possibility; another is magnetic marking tape used in place of conventional road striping. By alternating the poles of the magnets, developers can encode simple digital information that warns cars of upcoming exits or curves.

Aside from sensors to read these magnetic lane markings, vehicles will also need systems that can detect other cars and obstacles, to allow for platooning and collision avoidance.

into another lane where there's traffic, you have to know very well what's going on around that vehicle. That's a pretty difficult thing to do." The sensor of choice in this arena will probably be radar, although lidar – a laser-sighted version of radar – is also in the running.

While all the automotive electronics giants – including Bosch, Rockwell, Siemens, Nippondenso, and TRW – are working on smart-car systems, Delco Electronics has demonstrated the most advanced collision-warning rigs. They're mostly in prototype form, though some seem almost

signals are engaged.

So far, Delco has only two Forewarn systems in production: one is used to alert school bus drivers to the presence of children in their blind spots when the vehicle is stopped, and the other is a side-detection system for heavy-duty trucks. Both are priced around \$1,000. Other systems are likely to hit the market even before the automated highway prototype takes shape.

Perhaps best known for cranking out 22,000 car stereos per day, Delco Electronics also supplies dashboard instrumentation and many of the microprocessors and microcontrollers that go unnoticed (but not unappreciated) in modern vehicles. The collision-warning system's scanning radar and head-up display system come directly from the military-industrial complex – as does Ross Olney, my co-pilot in the Cadillac. Olney is part of an army of former defense specialists who have been beating their proverbial swords into plowshares since the end of the Cold War. Asking defense engineers to design smart cars might seem like asking a mathematician to balance your checkbook, but there are plenty of challenges blocking the road to intelligent transportation.

"It is significantly harder to put one of these systems on the front of a car than it is to put one on the front of an F-18 fighter jet," says Jeff Owens, Delco's executive director of emerging products and systems. "The fighters are operating in an environment that has no clutter. In a car, you're constantly bombarded with things you don't care about – guardrails, the surface of the road, curves, posts, or oncoming traffic. You don't notice any of that until you put a system on your car that lights up on everything."

"The radar is tough to solve, but the signal processing is just as difficult and as expensive," he explains, referring to the complex software and computing muscle needed to differentiate real threats from irrelevant objects. "You don't care about a bridge abutment until you're pointed right at it."

These technological hurdles don't seem to have Owens or anyone

David Carson: *The End of Print*



at

carmine



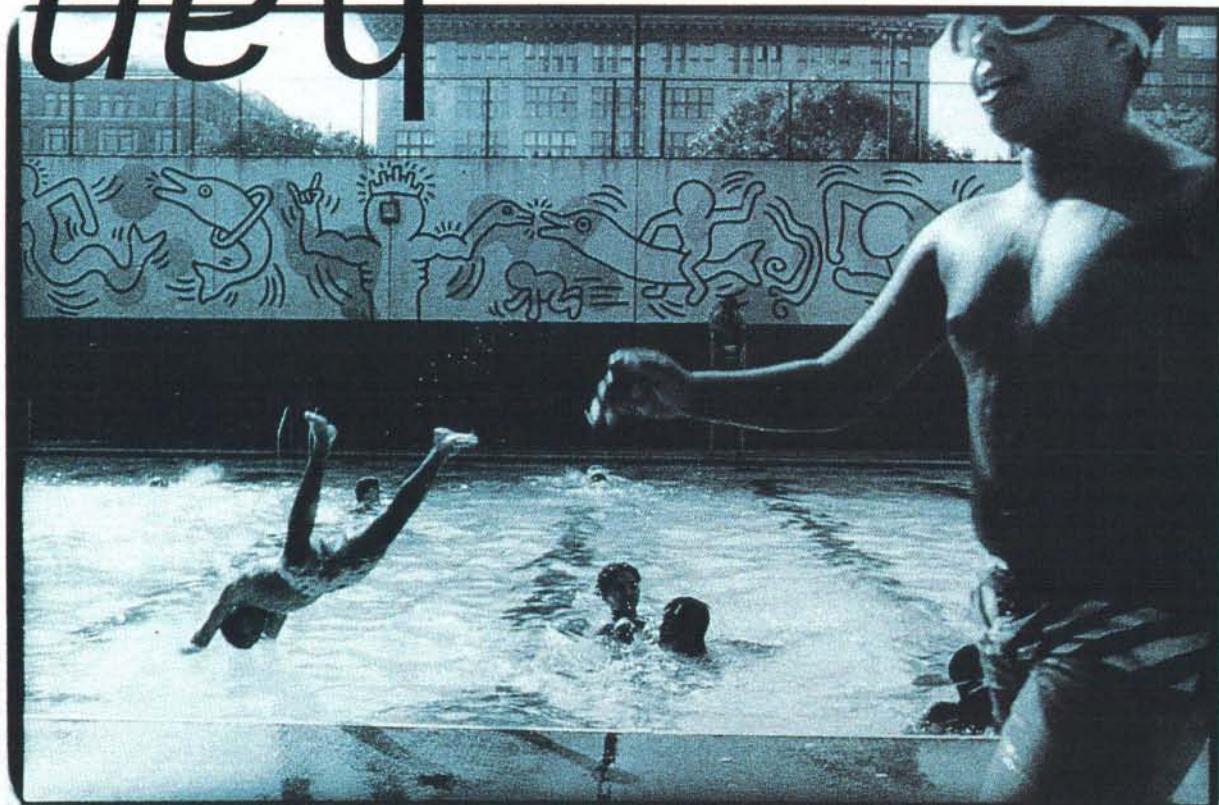
The year is 1979. And 1942. At a small neighborhood pool in Greenwich Village, a movie crew is time-tripping 30 years back to film the 1942 boxing drama "Raging Bull," the story of boxer Jake LaMotta. A gang of skinny, shirtless kids holler from a rooftop as the cameras roll. DeNiro, as Jake, wears his signature bathing suits and relaxes in chaise lounges, and local Mafia hoods in tropical shirts play cards. DeNiro has eyes for one woman in particular, and she's not even in the movie. She's a 15-year-old girl named Carmine, who's swimming laps in the pool. She's the star of the movie, and she's the reason why the movie is being made.

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o the past to film "Raging DeNiro (playing LaMotta). pool, women in one-piece platinum blonde who sits actor Martin Scorsese calls,



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*The End of Print: The Graphic Design of David Carson:
●●*●*●*●*●*●*●*●*●* Chronicle Books: +1 (415) 777 8878.*



SUPPORT

WIRES TAPPING

The Electronic Frontier Foundation went to Washington

HOW

to "reverse-engineer government, hack politics down to its component parts, and fix it."

GOOD PEOPLE

Then it helped pass the FBI's loathsome "let's-just-wiretap-everyone" Digital Telephony Bill.

HELPED MAKE

And discovered it was Washington that had reverse-engineered the EFF,

A BAD LAW

driving it into dissension, debt, disgrace – and right out of town.

By Rogier van Bakel

I went to the store the other day to buy a bolt for our front door, for as I told the storekeeper, the governor was coming here. "Aye," said he, "and the Legislature too." "Then I will take two bolts," said I. He said that there had been a steady demand for bolts and locks of late, for our protectors were coming.

— Henry David Thoreau

You are in a windowless ballroom in a plush, generic hotel just outside Washington, DC, and you're a little spooked, because you're in the company of a few hundred attentive men and women eager to learn how to wiretap your phone.

They're quite affable, most of these phone company folks. And serious. They engage in earnest discussions with a stream of speakers and panelists. They take notes. They study the contents of a bulky white binder given to them as they arrive. On the front, in blood-red letters, it reads: *Wiretap Workshop*.

At first, you feel uncomfortable, a fraud even. Frequently, the jargon goes over your head. But as the day progresses and you start to feel clued in and strangely buoyed by the can-do tide sweeping the room, the haze disappears, and you start to marvel at the power of it all, the intoxicating potency of the vision. The vision in question: to create a national information infrastructure, or whatever the term du jour is, with monitoring and surveillance capabilities built in. It's awe-inspiring. It's a bit like devising a new building code that says every room must have a microphone hidden in the wall, for the government to turn on at will.

It's easy to see why the FBI has been pushing for this kind of sea change. As the country's phone system gradually shifts from analog to digital, the wiretapping capabilities of law-enforcement agencies are being eroded. It used to be that any agent with a warrant could attach a few alligator clips to a copper wire and, if he or she got lucky, listen in on a drug deal about to take place,

an assassination being planned, or a bookmaker taking bets. With copper wires being replaced by digital equivalents, it becomes harder to make sense of anything intercepted. Voice and data transmissions on fiber-optic networks are broken into electronic bits that travel at warp speeds, take different routes, and are reassembled just before they reach their destination. On such networks, conventional wiretaps will yield a cacophony of useless electronic noise.

Since the late '80s, law enforcement has been looking for a solution. According to the Federal Bureau of Investigation, telecommunications carriers should be required to somehow adapt their new equipment so that wiretapping can continue. It's a view shared by powerful players in Washington – most notably, perhaps, Joseph Biden (D-Delaware), who was chair of the Senate Judiciary Committee during the Bush



He may be a Democrat, but that doesn't mean SENATOR JOSEPH BIDEN can't act like a spook. Biden introduced what eventually became the Digital Telephony Bill way back in 1991, before the EFF existed. It was bad legislation then, too. In fact, it was worse.



LOUIS FREEH is god's gift to the FBI. Loquacious, charming, a master lobbyist, it's hard to find anyone who has anything negative to say about the new FBI director. Fact is, he really believed our country would go to hell in a handbasket without Digital Telephony.



Veteran SENATOR PATRICK LEAHY worked with the EFF to fold compromise language into the bill. But when it came time to vote, Leahy proved he was, indeed, a politician. He swapped out a longstanding record as a privacy champion and voted yea.



REPRESENTATIVE DON EDWARDS didn't like the bill either, but he was about to retire, and as a well-known privacy advocate in the House, he knew which way the wind was blowing. He wanted to pass something less ominous before his time was up.

administration. In 1991, Biden introduced a Draconian senate resolution (S266) that proposed to take care of the problem. The measure never made it to a vote. But to the delight of the FBI's top brass, at least the issue was now officially on the table. Emboldened, the bureau drafted full-fledged wiretap legislation, which gained little support on Capitol Hill, partly because of strenuous opposition from civil liberties groups such as the Electronic Frontier Foundation and the American Civil Liberties Union. Then the tide changed, and a dormant issue became a bombshell.

In 1992, Clinton rode into town, recognized the problem, and cast it not in terms of privacy but technology. Not everyone agreed (more on that later) but Clinton's view, unsurprisingly, was one shared by Louis Freeh, the director of the FBI. A Clinton appointee, Freeh embodies that most elusive of com-

bination, a charismatic straight arrow. He's just the ticket to bolster America's crime-fighting spirit. Seen as a latter-day Elliott Ness, Freeh rules in Washington.

A senior lobbyist on Capitol Hill remembers that when Ron Wyden, a Democratic representative from Oregon, had a question about wiretapping, Freeh went over to the lawmaker's office and spent four and a half hours explaining the issue as he saw it. "The guy was all over the Hill, never let up," says the lobbyist who asked to remain nameless. "In all my years here, I have never seen that kind of lobbying by a top administration official. It was astounding."

"Stunning repudiation"

A news item in the *Kansas City Star*, February 9, 1994: "A judge threw out all evidence obtained from FBI wiretaps in what was described as the most expensive white-collar investigation in Kansas City history. The 96-page report of the reviewing magistrate concluded that the FBI's affidavit 'presented a disturbing pattern of material misstatements, overstatements, and omissions designed to mislead the issuing district court.' The outcome is 'a stunning repudiation of FBI tactics.'

Such roaring reprimands notwithstanding, FBI officials remain fond of their wiretapping authority. It's an infrequently used tool; for decades, federal wiretap cases have been measured in the low hundreds, although that number is now climbing. (The 1994 official count was 554. In addition, 600 state orders were granted.) But to anyone who wants to see wiretapping banned or curtailed – because it's ineffective, expensive, and may run afoul of the Fourth and Fifth Amendments – the FBI response is: Forget it. The future of law enforcement is at stake. "If you think crime is bad now," Freeh told the American Law Institute in 1994, "just wait and see what happens if the FBI one day soon is no longer able to conduct court-approved electronic surveillance."

Freeh never tired of driving home the point, and his prophecies got gloomier as time went by. In March 1995, he told the House that wiretaps were "crucial to the fight against drugs, terrorism, kidnapping, and sophisticated white-collar crime." Losing the ability to tap people's phone lines, said Freeh, would have an "effect so profound that law enforcement will be unable to recover."

The legislation Freeh toiled to get accepted was originally called the Digital Telephony Bill, or DigiTel, then rechristened the Communications Assistance for Law Enforcement Act. Civil libertarians simply speak of the wiretap bill.

Rogier van Bakel (rogier@li.com) is a writer in Connecticut. His most recent story for Wired was about Dan Hurley, the 60-second novelist.

Joe Biden made his second attempt to introduce such legislation in early 1994. This time, with a sympathetic administration applauding in the background and a pretty effective Mr. Nice Guy at the top of the FBI hierarchy, various Washington players pricked up their ears. Senator Patrick Leahy (D-Vermont) and Representative Don Edwards (D-California), both held in high regard by privacy proponents, were contacted by an EFF-initiated umbrella organization called the Digital Privacy Working Group. The group was made up of, among others, the EFF and ACLU as well as representatives from industry giants such as IBM, MCI, Microsoft, and AT&T. At the Privacy Group's behest, Leahy and Edwards asked Biden to hold off, giving them time to rewrite some of the more ominous passages in the bill. Biden agreed, but on the condition that a version of the bill would be on the table soon.

The resulting draft was partly based on recommendations made by Jerry Berman, then the Electronic Frontier Foundation's chief policy analyst. Stanton McCandlish, the EFF's online services manager, says the final version (the Leahy/Edwards draft) removed "as much FBI language from the bill as possible" and inserted "as much pro-privacy legislation as possible." The EFF did not oppose the bill outright, it saw the writing on the wall. A boldly updated wiretap law seemed unavoidable. The choice, then, was either to work within the system to defend and salvage privacy principles or to take the high road and avoid getting dirty hands. After much soul-searching, the group decided to stock up on soap and plunge right in.

Bug fixes

Here are some of the key features - call them bug fixes - the EFF helped implement in the final bill:

- To obtain so-called transactional records of online or plain telephone traffic, a law-enforcement officer now needs a court order instead of a mere subpoena. An online transactional record is the more revealing equivalent of a person's toll-call list. It's a log of when, where, and for how long a suspected party visited an information service, and when and with whom he or she exchanged e-mail.
- Internet service providers, online information services, and private bulletin boards will not have to implement new technology to facilitate wiretaps.
- The original bill states that the phone companies, when presented with a court order, have to give law enforcement encrypted messages sent over phone company wires and decrypt them - even if they don't have the key. That provision is about as smart and practical as requiring water utility companies to keep a detailed record of what each user flushes down the toilet. This impossible condition was absent from the final version of the legislation.
- The "radio part" of cordless phone calls (the

transmission between handset and base), which the government could listen in on with impunity, gets the same protection as any other phone call (a court order is required to wiretap).

• The Justice Department can no longer set standards for new digital networks. The industry is free to develop its own standards, albeit "in consultation with the Attorney General." In other words, it is public, not the result of unscrutinized backroom dealing.

• The phone industry will be reimbursed for software and equipment modifications required by the bill. The federal government promises to set aside half a billion dollars for this purpose, subject to appropriation, so that implementation costs won't lead to higher phone rates. (Of course, now the money will come out of all taxpayers' pockets instead).

The core element of the law, however, remains

SENATOR MALCOLM WALLOP, now retired, just might have stopped all this madness, had the EFF's John Perry Barlow called in a few political chips and asked his civil libertarian-minded friend for a favor. Barlow decided against it; Wallop now won't answer his phone.



According to JOHN PERRY BARLOW, the poet-laureate of the Net, there's no such thing as a perfect law. There are only ones that are better than others. Realizing that is what politics is all about. If you buy those rules of the game, then by all accounts, the EFF won.



When it was all over, the only member of the original EFF team left in Washington was JERRY BERMAN, who promptly split with the group and formed his own organization to lobby around similar issues. But was he a cunning negotiator, loose cannon, or sacrificial lamb?



One of three founding EFF members, software magnate MITCH KAPOR admits that his team was ambivalent about the move to Washington. But he saw the change of location as a chance to reinvent politics from the ground up. Instead, Washington reinvented the EFF.



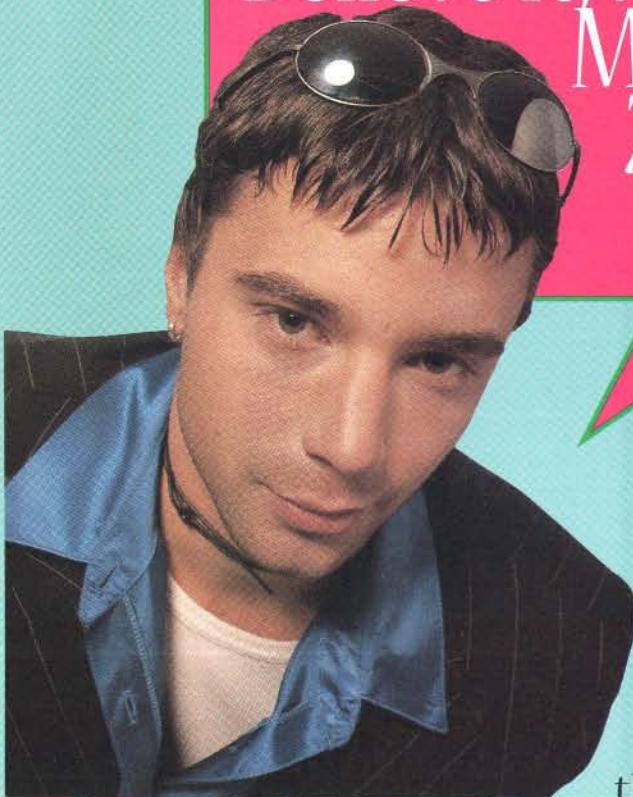
unchanged. It demands that common carriers - phone companies and competing cable enterprises - make new telecommunications equipment wiretappable.

Support for pragmatism

The final legislation, and its near effortless passage in October 1994 (a unanimous Yes in the Senate, only one No vote in the House), caused an uproar among Net cognoscenti. It's true that a slew of Electronic Frontier Foundation fans weighed in with support for the organization's pragmatic stance. They echoed the EFF's feeling that some law regulating these issues was bound to pass, and that it might as well have some EFF-brokered protections built in.

It's equally true that many of the group's grass-roots backers were disgusted by what they saw as spineless pandering and a missed opportunity to oppose 181 ▶

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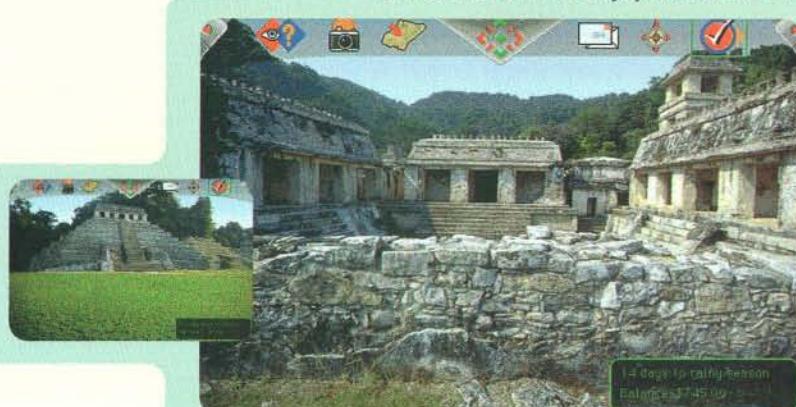
**INCONTEXT
SPIDER™**

Release: Early '96

Jaguar shields, vision serpents, stone temples crumbling in the jungle – Mayan civilization makes most fantasy worlds seem drab. Now, thanks to MayaQuest and the Web, adventurers don't have to spring for the airfare to ponder garish stone engravings of Mayan priests.

At the beginning of March, MayaQuest '96 Expedition launches an eight-week interactive bicycle expedition through Central America. Led by adventure cyclists Dan and Steve Buettner, children across the US whose schools are involved in the MayaQuest Exploration Program can participate via the Internet, choosing bike routes and asking the experts questions about Mayan civilization along the way. This year, MayaQuest is also hoping to hook up children in Belize for some live classroom discussions.

Devotees can also enjoy the CD-ROM, a compelling guide to Mayan culture, history, and mythology compiled from last year's bike expedition and Net adventure.



In it, you hop on a bike to cruise ruins in places like Chichen Itza and Uxmal.

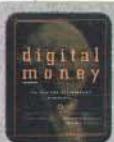
But be careful steering through the jungle! It cost me US\$200 in repairs when I ran into a tree at high speed. And if

you run out of money, or time, you might never find out why that king has a serpent foot and smoking axe coming out of his forehead. – Andrew Leonard

MayaQuest '96 Net Expedition Program: US\$85, CD-ROM \$49. MECC: (800) 685 6322, ext. 529, +1 (612) 569 1500, <http://www.mecc.com/>.

Release: February 9

CASHING IN: Digital Money is a slim book with a lot of filler, but it's one of the few places to go for an introduction to electronic commerce. Covering the basics, from cryptography to how the banking system works to operating a business on the Internet, it makes for a helpful primer. Just beware that one of the authors has a bias – Dan Lynch is the founder of CyberCash Inc. John Wiley & Sons Inc.: (800) 225 5945, +1 (909) 469 4400.



Release: Early '96

What do you get when you cross Oracle, the largest database company in the world, with

MONSTER PHONES

Philips, a consumer electronics giant? A true Frankenstein of telephones. The P100 screen phone does banking, e-mail, and when smart cards are put to good use, it will download money right to your home.

Make no mistake, the screen phone isn't a PC. It looks like a business phone with a handful of extras tagged on: an LCD, a 2400-baud modem, a keyboard, and an Intel-compatible 8086 processor inside. Philips and Oracle designed these phones with new screen-based services in mind, such as caller ID, three-way calling, and call forwarding. And while they

were at it, the partners figured, why not add remote access to a server?

Typing on the plastic keyboard takes you back to working on those dinky RadioShack TRS-80s of yore. The P100's black-and-white display, with just 16 lines of text, makes it pretty tough to send anything

more than short e-mails and reminder messages.

But with a national phone book accessible on the Philips-Oracle server and more screen phone services from local telcos on the way, the P100 screen phone is starting to look more like a natural step in the evolution of phones than a lonely monster roaming the heath. – Bob Parks



Philips P100 screen phone: For lease or US\$445. Philips Home Services: +1 (617) 238 3414.

Release: Early '96

PENCIL Pushers:

The neo-Luddite Lead Pencil Club solicited its constituents for thoughts on the electronic revolution. The result? *Minutes of the Lead Pencil Club*, a 200-page catalog with manifesto, cartoons, and essays by Sven Birkerts, David Gelernter, and others. No handwritten version yet available. Pushcart Press: +1 (516) 324 9300.

Release: Early '96

REMOTE FARM: As any farmer will tell you, tracking weather and knowing when to spray crops is a complex science. Show Me Plant Disease Forecasting System puts a virtual farmhand in the field. Its remote outdoor units broadcast weather conditions to farmers at home, letting them know

when their soybeans need attention. University of Missouri: +1 (314) 882 2002.



Release: February 15

For Mark Dery, a self-appointed maven of cyberspace, it is not so much that the personal becomes political, as the cultural becomes academic.

In *Escape Velocity*, his second book, Dery sees all emergent cultural pursuits – from the autogeddon of Mark Pauline's Survival Research Labs to online gender bending and Robocopulation – as texts to engage his whip-smart mind.

Dery explores the commonplace (surfing the Net) and the esoteric (cyborgs). His approach is to turn himself into a magnet that attracts, catalogs, and cites numerous sources. Even the most straightforward chapter, one on perfor-

mance artist Stelarc (né Stelios Arcadiou), finds him referring to *Star Trek: The Next Generation*, sci-fi author Bruce Sterling, New Age feminists from the 1970s, as well as – and this part almost goes without saying – Marshall McLuhan and Roland Barthes.

Riddled with jargon and compromised occasionally by overwrought analysis, *Escape Velocity* successfully breaks free of its academic tendencies to re-prove Dery an astute and trustworthy patrolman of the cultural and social borderland between science fiction and nonfiction.

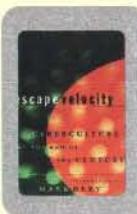
– Brad Wieners

Escape Velocity, by Mark Dery: US\$21. Grove Press: (800) 521-0178, +1 (212) 614-7850.

Release: February

SURF BY FAX: No longer will you look forlornly at techie billboards and say, If I could only check out that URL! Now, if you see a Universal Access stamp on a sign, you can dial an 800 number to receive a free fax copy of the Web site. Companies hope the service catches on as a clever way to advertise. This means you'll start getting junk mail in the fax machine instead of at the front door. Universal Access Inc.: +1 (805) 730-7775, <http://www.ua.com/>.

ESCAPE VELOCITY



Release: Early '96

SOUP IS GOOD FOOD

FOOD: Snapshots from digital cameras are cheap and simple to print, but they don't compare in quality to soup – that is, the traditional chemical process. Now, camera companies have come up with the best of analog and digital worlds – Advanced Photo System. This new film standard uses 24-mm film encoded with tons of digital information regarding light conditions, time of day, and a caption for print backs. Available at film stores.



Release: Early '96

First there was ftp. That begat Gopher, which begat the Web. Each successive system added new features and brought more people to the Net. Now a new system, Hyper-G, is being

THE WEB GETS HYPER

billed as the Web's heir apparent. Developed at the Graz University of Technology in Austria, Hyper-G extends the Web with a host of new features.

While a browser like Netscape can view a Hyper-G site, you'll need a Hyper-G browser such as Harmony or Amadeus to take full advantage of the system's extensions. Bidirectional links are a boon to Web site administrators, who can check links before deleting pages. Hyper-G also hosts search tools, a faster protocol than HTTP, better support for languages (such as Japanese), and tools to manage large Web sites.

Want to know more? Hermann Maurer's book *Hyper-G: The Next Generation Web Solution* is the place to start. Its strength – and weakness – is that it was written by the designers of Hyper-G, so it's steeped in technical minutiae. But if you're thinking of putting up a Web site, especially one that will offer a lot of dynamic content, you should consider Hyper-G. And that means you need this book. – Steve G. Steinberg

Hyper-G: The Next Generation Web Solution, by Hermann Maurer et alia: US\$39.95. Addison-Wesley Publishing Co: +1 (617) 944-3700.



Release: February

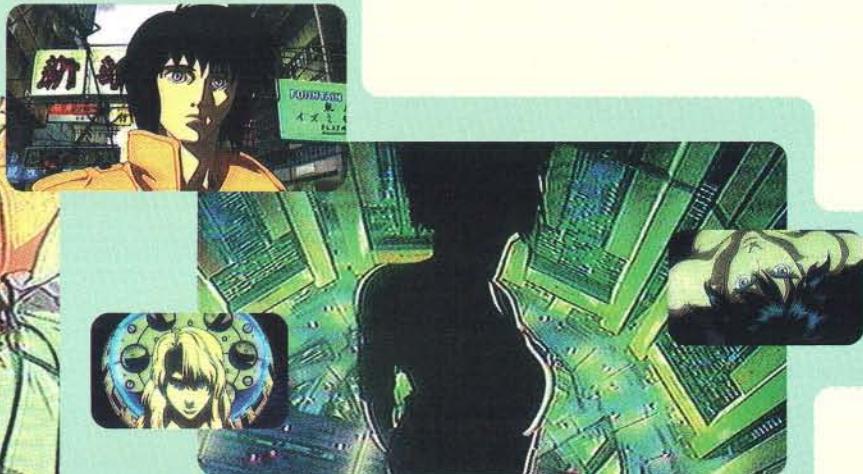
Blending the best of *Blade Runner* and *Total Recall*, director Mamoru Oshii's anime film *Ghost in the Shell* is a visual tour de force. State-of-the-art computer graphics and traditional animation techniques craft a surreal Tokyo circa 2029.

DIVINE INTERVENTION

Based on the manga of the same name by the artist Masamune Shirow, *Ghost* explores human morality in a mechanical world. In Oshii's world, cybernetically enhanced citizens embrace better living through robotics and virtual environments. Against this backdrop unfolds a tale of espionage, intrigue, and information war, as secret agent Project 2501 challenges the human-machine status quo by requesting political asylum and a real body.

Summing up the director's take on our technologically driven lives, a character in his earlier *Patlabor* anime shrieked, "I feel like a 2-year-old kid playing a fiendish videogame against God!" In *Ghost in a Shell*, Oshii reveals the divine side of that equation. — Paula Parisi

Ghost in a Shell: Playing in US theaters. Manga Entertainment Inc.: +1 (312) 751 0020, <http://www.manga.com/manga/>.



Release: Early '96

SPUD CITY: For the last year, Hasbro's new interactive division has been busy morphing Mr. Potato Head, its analog toy of yore, into a digital character. Now, join the spud and his daughter, Sweet



Potato, on a learning adventure to save drought-ridden Veggie Valley. Hasbro Toy Group: *Mr. Potato Head Saves Veggie Valley* CD-ROM: (800) 638 6927.



LOLLIPOP TO RIDE

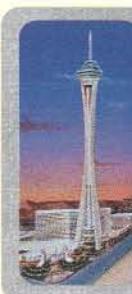
Release: January 15

WEB GETS SOAPY: After creating *The Crime Scene Evidence File*, a popular interactive mystery (<http://www.quest.net/crime/>), Tom Arriola saw his sleuth-action concept pop up on police Web sites. If fact again follows fiction, his latest Web drama, *Ferndale*, will spawn a new generation of mental self-help sites. To interact with *Ferndale*'s offbeat and neurotic characters, go to <http://www.ferndale.com/>.

The Seattle Space Needle, part postmodern totem pole, part lawn ornament, now has a massive and bizarre partner in orbit over Las Vegas. Towering 1,149 feet above the Las Vegas Strip, the Stratosphere Tower is the tallest structure west of the Mississippi. This conspicuous lollipop — a phallic emblem of the new Vegas theme-park economy and cornerstone of the US\$400 million Stratosphere hotel/casino complex — is capped by the Tower's Pod: a 12-story glass orb stuffed with wedding chapels, meeting spaces, and restaurants.

If that weren't enough, designers have wrapped the tower's top floors

with two thin-air thrill rides: a twisted red tinsel roller coaster and an over-the-top, zero-gravity simulation that propels riders 160 feet



into the sky up a long mast above the Pod.

Stratosphere's slot machines may or may not turn out to be loose, but with these sights, who cares? — Rick Overton

Stratosphere: (800) 998 6937, +1 (702) 382 4446.

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Post-Pop Life

Avant-pop. It's less a literary style than a point of view, a pomo stew in which pop culture infests every aspect of life and art, allowing characters like Dante and The Terminator to end up roommates. In the book *After Yesterday's Crash: The Avant-Pop Anthology*, editor Larry McCaffery takes on both the trashy trappings of pop and serious intent of avant-garde lit.

McCaffery's interpretation of avant-pop, like pop itself, puts up a pretty big tent, embracing graphics-heavy work such as Craig Baldwin's funny film strip and slide show conspiracy rant, "Tribulation 99," and Derek Pell's unsettling take on comix, "Weird Romance." The text pieces vary widely, from Steve Erick-

**Upside down, right.**

son's very American version of magic realism and Curtis White's deconstruction of *Bonanza* to Marc Laidlaw's faux encyclopedia entries and Eurydice's tale of desire, religious fervor, and human anatomy.

Not every piece works, and sometimes you get the feeling that some of the big-name authors (such as Paul Auster) are around more for advertising and history than for what's represented in the book. However, the effect, like pop, succeeds. It's sometimes jarring, sometimes funny, and always fascinating. —Richard Kadrey

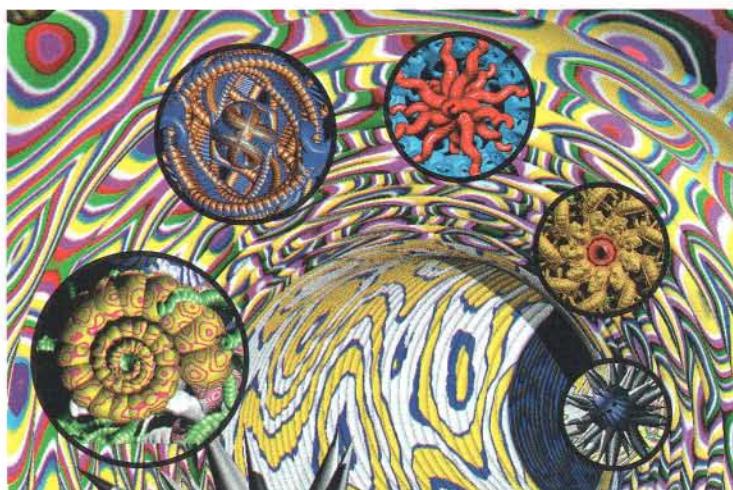
After Yesterday's Crash: The Avant-Pop Anthology, edited by Larry McCaffery: US\$12.95. Penguin Books: (800) 253 6476, +1 (201) 387 0600.

My Creation! It's ... Alive!

The Organic Art screensaver is the excuse to upgrade I've been waiting for! It needs a 486 with 8 Mbytes of RAM just to run, and a Pentium if it's really going to kick.

But why do you need 8 megs to run a crummy screensaver? Organic Art is more than monitor wallpaper. This app generates incredibly bizarre organic forms on your screen in 3-D and real time. Choose from a vast menu of shapes (toruses, cones, shells, petals, skulls, and, er, space stations). Pick backgrounds (go for the Escher dungeon or the 2001 starscape). Agonize over where to place the light source and which of the 14 lighting effects you'll use (beware the three-way disco spot option). Then the real fun starts.

After setting all the mutation parameters — an experience that makes you feel like Vincent Price playing a mad scientist, thereby justifying the cost of purchase — let the app run and watch what happens. Usually, it produces a creation so weird you're tempted to check yourself in for a psychiatric evaluation. Then you feel compelled to tweak it and run it again. And again. Oh yeah, if you want, you can also use your mutation

**Unleash living organic art.**

sequence as a screensaver. But really, this part is peripheral to the software's main business: really cool genetic algorithm-based graphics software.

Organic Art is brought to you by computer artist William Latham and technowiz Mark Atkinson. Before setting up Computer Artworks, Latham was an in-house digital artist for IBM. He is one of the few image makers whose work gets retrospectives at swanky galleries and is found pinned to the walls of Unix geeks, who dig the way it's coded. Latham and Atkinson's cyberdelic animations have been featured on more album covers, videos, movies, and dance floors than you can shake a tentacle at. Upcoming plans include an assault on the games world — though Latham's close-mouthed about the particulars, apart from the gnomic claim that its genetic algorithms could change the face of gameplay forever.

In the meantime, I'm happy tweaking my latest organic creation, Cosmic Ringos. Running on my 486, it's great. But Mom, don't you see? Now I *really* need a Pentium. —Hari Kunzru

Organic Art screensaver for PC CD-ROM: About US\$40. WarnerActive: (800) 693 3253, +1 (818) 840 2357, fax +1 (818) 841 0737, or Time Warner Interactive, UK: +44 (171) 391 4300.

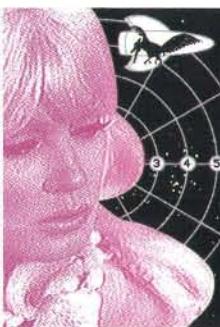




Space Commie Drive-In

Exploitation movie master Roger Corman is known both for his hit-and-run film techniques and for giving talented sprouts a shot at moviemaking. Combining these principles, in the early '60s, Corman bought some Soviet Sci-Fi flicks, kept all the expensive special-effects sections, and tossed the footage to a young director named Peter Bogdanovich.

Bogdanovich took the material and went totally nuts. His creation, *Voyage to the Planet of Prehistoric Women*, is a twisted drive-in gem. Using big chunks of the Russian movies, he added spice to the turgid space agi-



Curves ahead.

prop by assembling a bevy of blond babes (including the lovely Marnie Van Doren) for some quickie filming. These shell-bra, hip-hugger-wearing aqua queens are the telepathic inhabitants of Bogdanovich's planet Venus. By splicing the Russian film with original, matching scenes, the young director collaged together a '60s surrealist masterpiece – and one with a plot!

His impressive endeavor is proof once again that brains almost always triumph over budget. – *Richard Kadrey*

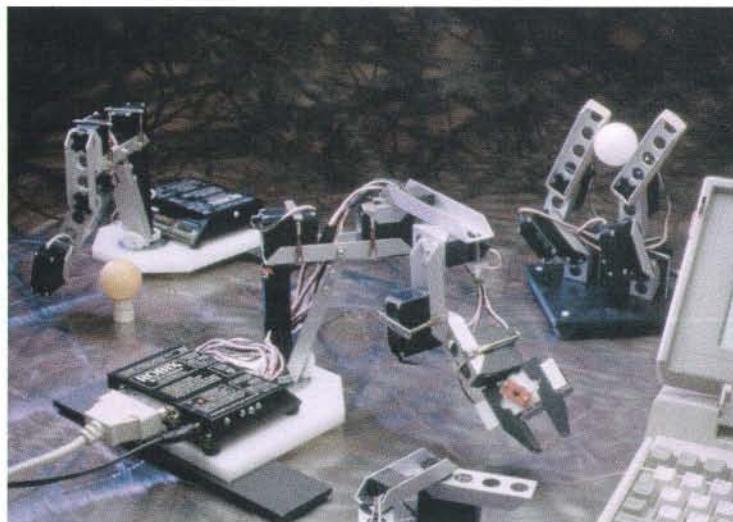
Voyage to the Planet of Prehistoric Women: US\$19. Sinister Cinema: +1 (541) 773 6860, fax +1 (541) 779 8650.

Robots 'R' Us

From the moment my son and I opened the shipping carton of our new Robix RCS-6 robot and saw the disclaimer "Robots may move suddenly and without warning," we were hooked. We've monkeyed around with most of the educational robots on the market (such as Lego Dacta, Movit, Capsela, RadioShack robot toys), and Robix is the most impressive by far.

The system comes in a nifty Tuff-Stuff toolbox that stores all the parts and tools. You get six servomotors, two types of project bases, anodized aluminum struts, nylon connectors, a gripper hand, wiring, PC software, an assortment of tools, and an adapter box that connects the RCS-6 to your computer through the printer port. The kit also comes with two videos (one presentational, one instructional) and a manual. Eleven projects are outlined in the basic kit, everything from a wriggling snake-bot to a series of robotic arms to a three-legged walker.

The robots are controlled through a Windows-like console program that's easy to operate but sophisticated enough to allow programming and macros for complex operations. The adapter not only has outputs



An Erector Set for the next generation!

for the six servos but places to add your own switches, sensors, lights, and other electronics.

After watching the two videos, we were up and running in no time, giddy with ideas about what kind of bots we would build. "We could put a robot arm next to the keyboard and have it issue its own commands!" said my 8-year-old. (I think he's seen *Short Circuit* too many times.)

The RCS-6 kit sells for US\$495, a bit pricey for the hobbyist, but the quality of the components and the versatility of the system make it worth every penny. The servos alone cost almost half that much. Educators with the budget for this kind of thing would be foolish not to spring for some kits. The RCS-6 system is rugged enough to withstand ultra-light industrial use for demonstrations. According to the Robix Web site, several companies are using RCS-6 systems for demonstrations like test tube sorting in labs.

Robix is the kind of intelligent and fun product that gets kids (and I use that term loosely) excited about learning. Let's hope it catches on and becomes the next generation's Erector Set. – *Gareth Branwyn*

Robix RCS-6: US\$495. Advanced Design Inc.: +1 (520) 544 2390, fax +1 (520) 575 0703, e-mail desk@robix.com, on the Web at <http://www.robix.com/>.

Can't Take It with You

You're going to die. But when the big sleep comes, you don't want to leave your loved ones with lots of questions to answer, crap to clean up, lawyers to wrestle with, and assets to distribute. A good will can take care of all that. And thanks to WillMaker 6.0, drafting your last testament can be a private and relatively painless process.

Setting up a will can be as simple as saying, "My wife/husband/companion gets it all." On the other hand, some locales demand more specific divestments, and children add an extra layer of complexity to the process. Fortunately, WillMaker thinks like a lawyer so you don't have to. The package comes with a helpful guidebook, and the software walks you through the process, creating your will after a simple question-and-answer session. New features in the 6.0 release also make it friendlier for nontraditional families such as unmarried couples, same-sex part-



How to figure out what to leave behind.

ners, or those with children from previous marriages.

WillMaker lets you create a basic will, name an executor, set up guardianships for minors, and specify how much of your estate should go to children, relatives, charities, or live-in companions. You can also use the software to set up a living will – and if you have strong feelings about how you want to end your life, either in a hospice or on a respirator, you need to put these specific health care limits in writing. The software also helps you plan your "final arrangements." Best of all, it's easy to update the document immediately. And you can make it all legal, on your own.

This package makes an uncomfortable subject easy to deal with. After all, it's a lot easier to bequeath your old gym shorts and Don Ho albums to a relative you hate if you don't have to explain it to a lawyer. – *Richard Kadrey*

WillMaker 6.0 for Mac and Windows: US\$69.95. Nolo Press: (800) 992 6656, +1 (510) 549 1976, America Online: keyword: Nolo.

Showdown at the VR Corral

The Old West hasn't found much of a home in the computer game world, but *Dust: A Tale of the Wired West* gives every console cowboy reason for hope. An interactive western story, *Dust* puts you in the boots of a nameless spaghetti-western stranger who has drifted into the lawless desert town of Diamondback, New Mexico, circa 1882. Broke, weaponless, and on the run from a vengeful gunslinger, you've got just four days to arm yourself, scare up some cash, restore order to the town, and solve a mystery. Add to that the 40 or so characters you can meet, aid, or thwart — plus the



Draw, pardner!

serious cowboy business of drinking, gambling, and posturing — and you end up with a mighty satisfying game experience.

Like a good gunslinger's holster belt, the game's approach is spare and versatile. Diamondback's townsfolk are stuffed with opinions and agendas. That's important to remember, because after you converse with characters in the game, they continue about their business, interacting with each other behind your back. Make waves with the wrong person, and you may find you've got more enemies at dusk than you had at dawn. — Chris Hudak

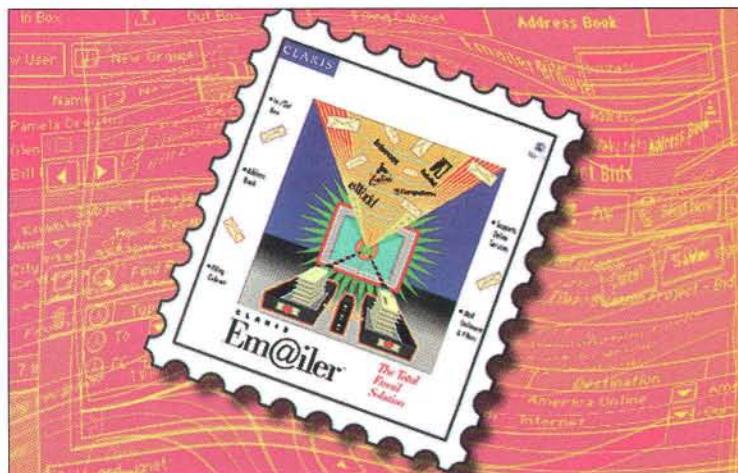
Dust: A Tale of the Wired West
CD-ROM: US\$50. Cyberflix
Inc.: +1 (615) 546 1157.

All-in-One E-Mail

Ideas for breakthrough software are hard to come by these days. Does anybody really need another word processor, another desktop launcher, another screensaver? Just when you thought all progress is incremental at best, Claris releases Claris Emailer, a smartly conceived program that radically simplifies receiving and sending e-mail.

People who have a single account with an Internet service provider probably have no overwhelming need to toss trusty old Eudora for Emailer — unless they can't resist the latter's slicker look. Ditto for users of just one commercial online service. But if you have multiple accounts, your life could become a little easier.

Emailer lets you send and retrieve e-mail on multiple services with one phone call (if you have a SLIP/PPP account) or with a few phone calls in one session (if you use different access numbers for each service). The benefits are obvious: no need to launch one application after another and log on separately each time. Plus, you get all your e-mail in one basket, making it much easier to file messages. Of course, you can create as many folders as you want. A nice side effect, in my case at least, is that Emailer is a time and money saver. That's because I'm no



A clearinghouse for all your e-mail accounts.

longer tempted to go exploring on the big online services once signed on, if all I had intended to do was check my mail.

Emailer is more powerful and sophisticated than Eudora — perhaps its closest competitor — but, understandably, not as intuitive. Other foibles are harder to forgive. The program supports the Internet, eWorld, America Online, CompuServe, and RadioMail, but not Prodigy or Delphi. A TCP tool is included for AOL and eWorld, but not for CompuServe; if you want to connect to CompuServe through your Internet account, you have to track down that piece of software yourself. (Claris says it's working on an enhanced version — I tried Emailer v1.0.) Other gripes: a built-in spell checker would have been nice (the similarly priced Eudora Pro is ahead of Emailer here). More important, the program was not as stable as I would have liked, requiring two reinstalls in just 10 days after repeatedly freezing at start up.

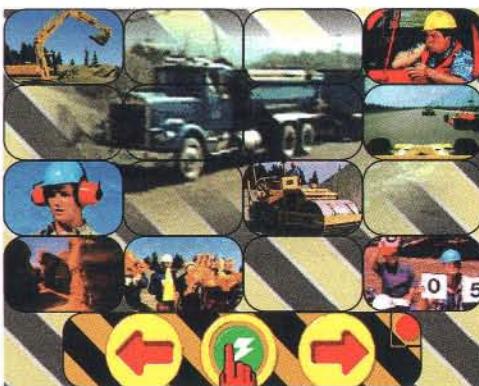
Still, the idea behind Emailer is as simple as it is brilliant. While would-be buyers might want to wait until Claris makes the promised improvements, the program is already a contender for software gem of the year. — Rogier van Bakel

Claris Emailer: US\$69. Claris Software: (800) 544 8554, +1 (408) 727 9054. Free trial software available on America Online, CompuServe, and eWorld, and on the Web at <http://www.claris.com/>.

Construction Ahead

My 3-year-old son, Gavin, is seriously obsessed with *Kids on Site*. It's been three weeks since we got it, and he still wants to have the manual in bed with him when he goes to sleep. "Let's go do the digger!" he cries upon waking each morning. And we do — over and over again. This kind of computer-related excitement hasn't been seen in our house since *Doom*.

The digger — or excavator in adultspeak — is one of four heavy machines the player can operate in the child-hypnotizing *Kids on Site* CD-ROM. This is essentially an interactive version of those mesmerizing construction site highlight videos. Now, instead of sitting in front of the TV all glazed over and placid, kids climb behind the controls of *Billy the Bulldozer* and go hog wild. The interface is a breeze: it has three movement buttons and a help symbol. Pit characters Bertha, Dizzy, and Nuts guide the proceedings, and you earn merit badges for each seg-



Gavin says, "Let's go do the digger!"

ment you complete. The eternally lounging work crew also eggs you on and scores your performance. You can move mountains of dirt and demolish buildings with a wrecking ball. On the down side, one wrong move in the steamroller, and you'll find Nuts flattened like Wile E. Coyote on the asphalt. There's just enough comical destruction and mayhem here. Once each mighty machine is mastered, the grand finale, in all its explosive glory, is a reward any kid will thrill to.

The simplicity of the gameplay and the universally exciting content make *Kids on Site* first-rate. Gavin's hooked. I can handle the game manual in the bathtub — I just hope he doesn't start wearing his pants low on the hips with his booty hanging out. — Scott and Gavin Taves

Kids on Site: US\$19.95. Digital Pictures Inc: (800) 262 5020, +1 (415) 345 5300, fax +1 (415) 286 8811, e-mail digikids@digipix.com, or on the Web at <http://www.digikids.com/>.



It's Yorb World

The F-Word

There are at least two qualifications a book like *The F-Word* – a paperback with thousands of uses of the word *fuck* – should meet. First, it must be comprehensive, so you can find your favorite fucking usages; and second, well-organized, so it doesn't postpone gratification to the point where you no longer give a fuck.

On these counts, *The F-Word* succeeds. Some may have nits to pick, though, as I did. I found seven of my top 10 F-words immediately, (including *fuck a duck*, *rat-fuck*, and *abso-fucking-lutely*). But missing was *joke 'em if they can't take a fuck*, although

The

F

Word

Edited by Jesse Sheidlower
WITH A FOREWORD BY ROY BLUDOW, JR.

Not to be taken in vain.

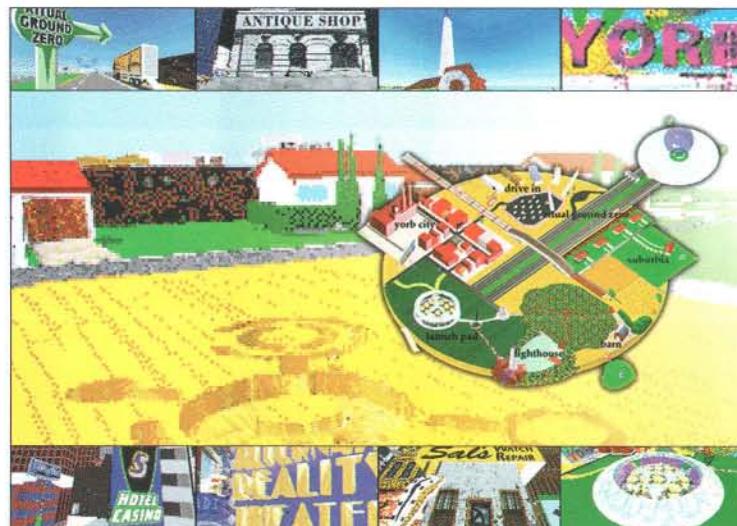
I did find the original *fuck 'em if they can't take a joke*.

Still, there were plenty of surprises, like *snufu*, which I had no idea began as a military acronym for *situation normal, all fucked up*. As to this book's durability – it's a little early to say, but *The F-Word* may get an F. It has one of those new glossy covers that curl up like a desiccated leaf after a few minutes in the sun – not exactly a promising sign for a book destined to make the rounds. And yet, if the book endures, you can bet fewer will take the F-word in vain. – Brad Wiener

The F-Word, edited by Jesse Sheidlower: US\$12.95. Random House: +1 (212) 751 2600.

Years from now, New York University's experimental interactive TV show – *Yorb: An Interactive Neighborhood* – may turn out to be the 8-track tape deck of multimedia. But until then, beware. This super-low-tech work-in-progress, produced by NYU students on a shoestring budget and skeletal electronics, is teaching a few tricks to media giants.

By tuning in to Manhattan public-access cable and dialing a local phone number, you're off into the madly inventive landscapes of *Yorb* (short for "your orb"). Characters are assigned to as many as four callers, who navigate using the telephone's number pad; one of the four becomes the pilot. Pressing 1 moves the pilot left, 2 straight ahead, 3 to the right. The navigator leads viewers through sites such as the *Yorb Drive-In* movie theater, a surrealistic playground called *Dalfwood*, a petting zoo, and a community fair that posts information on real-life local groups. If the explorations get too dull, *Yorb* yanks the caller and lets in another. Anywhere from one to several dozen folks get on the air during each hourlong show. At the bottom of the screen appears a live text box that is linked to the *Echo* bulletin board. Chat ranges from



Yorb is a lot like New York – things go in and out of business regularly.

the sublime ("Why *Yorb*?") to the slime ("Man, that *Yorb* hostess is a major babe!").

The brains behind the defiantly simple *Yorb* is San Francisco Bay area multimedia veteran Nick West, a proponent of interactivity geared toward communication, not commerce. Now in its third year, *Yorb* resists stasis by constantly branching out, trying new projects like providing a virtual "house" to local artists, or showcasing photographs from students at a nearby middle school. The whole show should be accessible via the Web early this year.

"*Yorb* is a lot like New York," West explains. "Things go in and out of business regularly." Unfortunately for *Yorb* fans, its audio and video signals can go in and out of commission with some regularity as well. But if the 5,000 or so people who call in each week are an indication, viewers don't seem to mind *Yorb*'s technical mishaps too much.

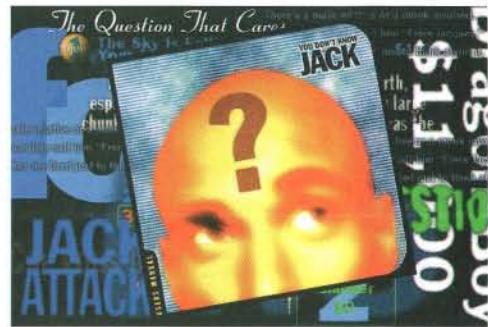
– Jeff Swimmer

Yorb: An Electronic Neighborhood Thursdays, 11 p.m. to midnight, Manhattan Cable public-access channel 34. To participate, call +1 (212) 443 9672, or telnet to echonyc.com and use the username and password "yorb." New York University Interactive Telecommunications Program: +1 (212) 998 1880, e-mail nick@inch.com, on the Web at <http://www.itp.tsoa.nyu.edu:80/~yorb/web/home.html>.

What's Your XQ?

Berkeley Systems – the company that made computer monitor preservation cool – has taken another hip step forward. It's using computer games to bring people together and reward the mental accumulation of '70s TV factoids, Generation X trivia, subcultural tid-bits, and shreds of pop science. *You Don't Know Jack* puts one to three players in the midst of a virtual game show, complete with a wise-cracking MC, a house band, and camera crews chattering in the background.

Success in answering the more than 800 offbeat questions depends on how much useful and useless crap you've managed to fill your mind with in recent years. Categories include *Star Trek* and genetics, sexually repressed commonwealth cultures, mein summer kampf, and others equally off-the-wall. The first player to hit the answer buzzer – a key assigned to each player seated around the computer – gets a chance to answer the question or screw a competitor by forcing him or her to answer an especially tough one. The nature of the questions favors the learned mind as well as the couch potato. Ornithology and *Gilligan's Island* are equally likely fodder.



What commonwealth cultures and genetics have in common.

Just when you've gotten used to being asked fairly straightforward questions about bizarre subjects, along comes the gibberish question, for which players must use sound and rhythm to decipher a phoneme-mangled answer, or the Jack attack, which bombards the player with words that he or she must connect in literal, figurative, or even subliminal ways. The wise-ass MC's running commentary on players' performances is funny and caustic – it reinforces the illusion of interaction with a real host.

Berkeley Systems is plotting to produce future "special edition" modules à la *Trivial Pursuit*, which will give new sets of questions centered on themes. Perhaps the Vulgarly Connection? Or the all-Monty Python Edition? The mind reels.

You Don't Know Jack is the unexplored frontier of computer quiz games, and like every other Berkeley Systems product, it's entertaining, slick, and classy in its own geeky way. Check out *You Don't Know Jack*, and put those after-school TV hours to work!

– Chris Hudak

You Don't Know Jack CD-ROM: US\$30. Berkeley Systems Inc.: (800) 344 5541, +1 (510) 549 2300, on the Web at <http://www.berksys.com/>.

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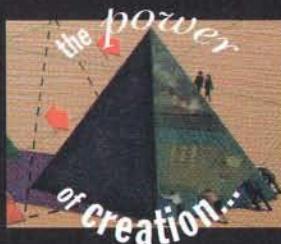
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Tom Russell

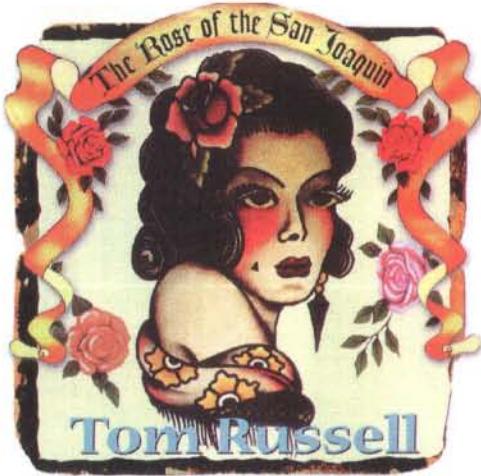
The Rose of the San Joaquin

HighTone

Access Code 1244

Tom Russell is one of America's great "unknown" singer-songwriters – a noir cowboy who can whisper like the dust blowing down a deserted highway or howl like a drifter waking up with a toothache after a three-day binge. If Jim Thompson had picked up a guitar instead of a typewriter, he might have ended up like Russell, an artist whose forte is depicting hard-livin' working folks in sharp vignettes, backed by gritty, roots-drenched music so authentic it's almost embarrassing – like eavesdropping on somebody's Saturday-afternoon confession.

Russell has seen many of the hard times he sings about. He grew up on a California ranch in the 1950s, got hooked on country and folk music in the '60s, and by the '70s was playing skid-row country



bars, backing topless dancers, dog acts, and sword swallowers. Russell's mix of classic rock, honky tonk, *norteño*, and Texas waltz – all with sparse, reality-steeped lyrics – has confounded radio's narrowcasting format for a decade. Even so, his tunes have been successful among people with mainstream musical palates: Suzy Bogguss's cover of "Outbound Plane" became one of the most frequently played country songs of 1993.

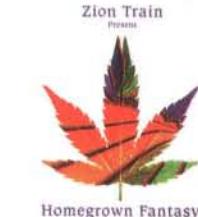
On *The Rose of the San Joaquin*, Russell is joined by folk legend Ian Tyson and producer Dave Alvin for a set that explores America's dark side with uncommon compassion and insight. Nobody but Russell could write a song like "Somebody's Husband, Somebody's Son," the portrait of a loner on a shooting spree – the piece humanizes the killer without dismissing the horror of his deeds. The album is a shotgun blast of raw emotion, with neither a spare note nor a superfluous image; nothing but gut-wrenching tales of heartbreak, murder, and regret, guaranteed to squeeze your heart like a callused trigger finger. –j. poet

Los Straitjackets

The Utterly Fantastic and Totally Unbelievable Sound of Los Straitjackets
Upstart Records

Access Code 1245

Behind sparkling Mexican wrestling masks, this Tennessee foursome shreds the eternal surf wave. Skittering guitar lines curl over tight-barreled rhythms, drenching the tunes in a green room of reverb or soaking them in a mellow sun. Produced by genre-crossing master Ben Vaughn, this album provides plenty of variation. Dig the fuzz grooves on "G-man," cruise on the supersmooth "University Blvd.," or bop with "Lynxtail," one of the album's best breakers. Despite the freakish masks, this one's pure guava. – Roger Park



Zion Train

Homegrown Fantasy
Mesa Records/Blue Moon

Access Code 1249

The London sound system that goes by the name of Zion Train officially lists itself as a "cooperative" but remains tight-lipped about specific personnel. Regardless, the band's wild beats – a mixture of techno, ska, roots reggae, and dub, all with a touch of acid jazz – have a pleasing international and intercultural flavor. "Healing of the Nation," a jungly ode to herbal well-being, and the ska-meets-rave "Dance of Life" are guaranteed to shake your musical preconceptions as well as your booty. –j. poet

Leonard Nimoy

Leonard Nimoy Presents Mr. Spock's Music from Outer Space
Varese Sarabande/Varese Vintage

Access Code 1246

You won't need a transporter to experience the many moods of Mr. Spock. This album dishes up a crowd-pleasing casserole of space Muzak, *chansons d'amour*, and meditations on the very nature of being. Don't let his cold, logical exterior fool you – inside this Vulcan beats the heart of an interstellar Paul Anka. You haven't lived until you've heard the pointy-eared one croon "Where Is Love?" from *Oliver!* Throw in a shot of Saurian brandy, and you've got a great recipe for galactic kicks. – Jeff Baskin



Dent

Stimmung
Magnetic

Access Code 1250

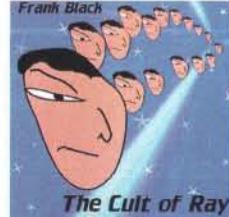
Stimmung offers uninitiated earthlings an introduction to the amoebic musical organism called Dent. And what a thrill it is. Brought to you from their homeworld in Questa, New Mexico (land of cosmic nuptials, tumbleweeds, and eccentric humans), this hybrid of transcendental communiqués, country twangs, and folksy riddles reminds us that the inveterate soul of free-form composition is alive and well. Unconcerned with "alternarock" standards, Dent breaks the floating, psychedelic paradigm with a refreshing earthbound wholesomeness. – Kristy O'Reilly

The Pharcyde

Labcabincalifornia
Delicious Vinyl/Capitol Records

Access Code 1247

If you breathed a day in the 1970s, this disc will transport you back to the era of the concept album, delivering a tuned-in tribute to the remote-control generation. Rubber-soled effects weave complex harmonies with funky kitsch, as edgy samples force some irregular breaks throughout. Though they could lose some of that serve-it-up-bitch machismo, the band's musicianship flies right. Sublime connections between jazz and trip-hop make The Pharcyde's freaked-out second release shine. Intelligent theater of the absurd. – Shauna Sampson



Frank Black

The Cult of Ray
American Recordings

Access Code 1251

Frank Black rolls out the wily welcome mat on this animated, self-produced record. Though he retains his puckish drawl amid a torrent of chewy, spiraling tunes, there is nothing flighty about this third solo release. Even when he plays with distortion, it's congenial. Black may pose as the frolicking poster boy from beyond, but his feral flair for nimble pop transcends even his spry vocals, astro-gazing lyrics, and felicitous glee. He may be tucking you under the covers, but he's leaving with your pillow. – Allison Diamond

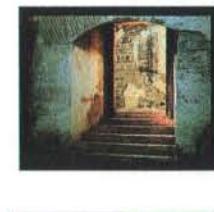
Paul Dresher

Casa Vecchia
Starkland

Access Code 1248

Paul Dresher is perhaps the best of the postminimalist composers who learned at the altar of Reich, Riley, and Glass. Highly acclaimed for his music-theater pieces, Dresher demonstrates a versatility that transcends categorization. *Casa Vecchia*, a stunning string quartet arranged here for eight instruments, invokes the minimalists while echoing the spirit and beauty of quartets by John Cage and Samuel Barber. Included are two unexpected but marvelous synthetic soundscapes and a terrific, gently percolating piece for bass guitar and electronics. A gorgeous gem. – Dean Suzuki

PAUL DRESHER
CASA VECCHIA



Marilyn Manson

Smells Like Children
nothing/interscope Records

While Manson's début, *Portrait of an American Family*, gave death metal an intellect, and even something of a conscience, *Smells Like Children* heralds a bout with experimentation. The band spins its wheels in places: splice-and-dice loops, bookend bits of dialog, even a ghastly podunk retitled remix of Manson's hit "Cake and Sodomy." The EP features a spooky gumbo of earlier tunes given high-energy cosmic treatment, and blistering covers of "Rock and Roll Nigger" and The Eurythmics' "Sweet Dreams (Are Made of This)." Loud, evil, and rockin'. – Chris Hudak

Microwave o' the Month



MICROWAVED CD: LISA SEAMAN

Debbie Gibson

Think with Your Heart

EMI Records Group

Serving suggestion: throw on a tattered sequined number, pour yourself a scotch, light up a Lucky Strike, and lose yourself in the sheer magic of Debbie. — Steven Overman

MUSIC ACCESS

If you'd like to hear
excerpts from these discs,

call (900) 454 3277
(95 cents per minute)

Touch tone required. US only.
Under 18? Get parent's permission.

When prompted:
Enter access code Music controls:
(under the name 3-Fast forward
of the artist) 4-Louder
5-Softer
*-Exit music/bypass
most prompts

A charge of 95 cents per minute will appear on your
phone bill. An average call is about 2.5 minutes.
Music Access samples for reviews in this issue are active
January 7, 1996, through April 1, 1996.

At the beginning of each music review, you'll find a four-digit code for each album. To hear sample cuts, dial the 900 number above, entering this code when prompted. You'll hear up to three minutes of music, at 95 cents per minute. To fast forward, punch 3; for louder volume, 4; softer, 5. To use Music Access, you must be 18, have a touch-tone phone, and dial from the US.

Code Artist and Title

- 1244 Tom Russell, *The Rose of The San Joaquin*
- 1245 Los Straitjackets, *The Utterly Fantastic and Totally Unbelievable Sound of Los Straitjackets*
- 1246 Leonard Nimoy, *Leonard Nimoy Presents Mr. Spock's Music from Outer Space*
- 1247 The Pharcyde, *Labcabincalifornia*
- 1248 Paul Dresher, *Casa Vecchia*
- 1249 Zion Train, *Homegrown Fantasy*
- 1250 Dent, *Stimmung*
- 1251 Frank Black, *The Cult of Ray*



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Free Thinking

In an age when intellectualism is either ridiculed as anti-American or trivialized by preening pop-culture sound biters, recalling the life of Gertrude Stein is like a hurricane of fresh air. For the first half of the 20th century, Stein was at the epicenter of Western intellectual activity, and her apartment in Paris was a magnet for the greatest writers, philosophers, painters, statesmen, filmmakers, and raconteurs of the day.

Gertrude Stein: When This You See, Remember Me is a video that lovingly celebrates this amazing force of human nature. As a writer, Stein's avant-garde turns of phrase delighted and perplexed those who came across her poetry, essays, and opera.



Magnetic resonance.

As an art collector, she championed rising talents such as the young Spanish painter Pablo Picasso. A feminist before the term feminist existed, she pioneered the public debate on equal rights for women. And in her long and loving relationship with Alice B. Toklas, Stein was open and proud of her lesbianism in an age when homosexuality was a criminal offense.

With rare photographs and newsreel footage, plus the only radio recording Stein ever made, this marvelous documentary creates a potpourri spiced by the likes of T.S. Eliot, Jean Cocteau, and Ernest Hemingway.

- Phil Hall

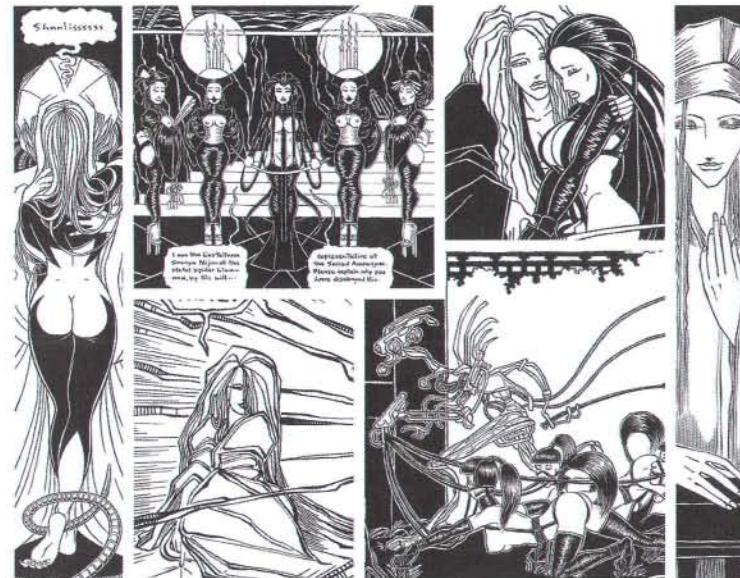
Gertrude Stein: When This You See, Remember Me:
US\$39.95. Meridian Video Corp.: +1 (310) 231 1350.

Spiderotica

NBM is a publisher specializing in quality reprints of adult erotic comic books from Europe. In English, it has published the violent and satirical *Ranzerox*, Guido Crepax's reworkings of *Emmanuelle*, the writings of the Marquis de Sade, and the surreal and lovely fantasy *The Magician's Wife*. Recently, NBM started publishing original works by US artists. One of the best is Michael Manning's *The Spider Garden*.

It's the tale of the androgynous Shaalis, who receives the slave Okami as payment for a gambling debt. Shaalis exists in a futuristic royal society of wealth, sensation, and fascination that would make de Sade proud. The story line combines sci-fi, Japanese folk tales, and palace intrigue with pansexual groupings of women, men, mixed-genders, and machines.

Employing spare, elegant prose and a visual style that mixes fine art, manga, and some of the Euro-comic styles, the art work and storytelling are both complex, complementing each other. It's seldom that you find



An incendiary blend of intelligence and heat.

artists who can write and writers who can draw, but Manning accomplishes both in *The Spider Garden*. He effortlessly moves from scenes of court scheming to action sequences, mixing it together with omnosexual groupings of women, men, mixed genders, intelligent/modified animals, modified humans, and intelligent machines.

Manning is revealing a very personal mythology here, letting his deepest fantasies seethe to the surface. He filters this vision through his intelligence and art, creating something that transcends libidinal dreams themselves. His speculations focus on power relationships, and our relationships to each other's bodies and the machines that lurk in our modern-day settings.

What sets him apart from his contemporaries is the insight he brings to his work. When so much erotic heat combines with these smarts, the results are indeed incendiary. - Richard Kadrey

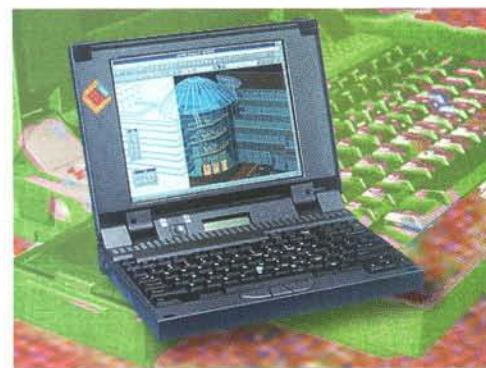
The Spider Garden, by Michael Manning: US\$11.95. NBM: +1 (212) 545 1223, fax +1 (212) 545 1227.

Tadpole No Wimp

Tadpole Technology made its name selling almost indestructible portable workstations. Lately, though, the market and consequently this British firm have fallen on hard times. The Tadpole P1300 is the company's attempt to survive by going mainstream.

The Pentium-based P1300 is built like a tank and feels like it - it weighs a hefty 7.5 pounds. Its magnesium casing is more durable than plastic and designed to dissipate the heat of the processor. Plus, there are impressive features under the hood.

The P1300 is based on Tadpole's Advanced Notebook Architecture format. I like the removable hard disk (available in sizes from 340 Mbytes to 1.2 Gbytes). The SCSI can be swapped out to run the box with different operating systems. The screen is stunning - 800 by 600 pixels in a day when most laptops are still 640 by 480. There's even 16-bit stereo sound.



The Sherman tank of laptops.

The P1300 is also loaded with ports. There's a connector on the back for a mini docking station that gives you a SCSI-2 connector, an external keyboard, and a serial port. The unit features a full-size Lexmark keyboard with excellent feel and an integrated pointing stick. And, of course, there's a 133-MHz Pentium processor driving the bus.

But the P1300 betrays Tadpole's workstation roots. This box is much more comfortable running Solaris or Linux than using Windows 95. The 1.5-hour internal battery charge Tadpole promises is great for Unix, but pretty pathetic for a Windows-based PC. (You can get up to six hours with Tadpole's external battery pack.) That's also why there's no sleep mode: Unix doesn't support it.

I like the P1300. It's a stylish box, and it's just the thing for rough road trips. But not light enough to make its way into my backpack. - Simson Garfinkel

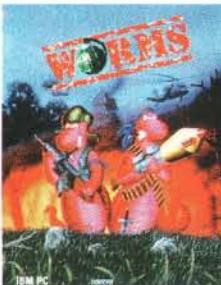
The Tadpole P1300: US\$6,995. Tadpole Technology Inc.: (800) 232 6656, +1 (512) 219 2200, on the Web at <http://www.tadpole.com/>.

Can of Worms

Most computer war games are about as enjoyable as being beaten upside the head with a dead fish. Is anyone under 50 really supposed to appreciate the dauntingly thick manuals, the "functional" (horrendous) graphics, and the horrors of war presented under the guise of entertainment?

Now, *Worms* is my kind of war game: skinny manual, great graphics, and a blissfully simple premise. You control a platoon of itty-bitty critters as they walk, run, jump, and burrow through a randomly generated landscape, killing enemy worms with reckless abandon.

The highlight here is the number of hilarious methods of killing at your disposal. There are conventional



Worms'll hook ya.

weapons, such as bazookas, homing missiles, and hand grenades, and not-so-conventional weapons, such as cartoon-size sticks of dynamite, karate moves, and exploding sheep.

Worms supports up to 16 players on either a single computer or a network, which means you'd better have a big-ass den or get the modem/network upgrade.

If you enjoy controlling large groups of slimy life forms or causing massive explosions with friends, get yourself a can of *Worms*.

—Zach Meston

Worms PC CD-ROM:
US\$49.95. Ocean of America
Inc.: +1 (408) 289 1200, fax
+1 (408) 289 1889, on the
Web at <http://www.oceanltd.com/>.

ROXANN BIGGS-DAWSON is better known as B'Elanna Torres, the half-human, half-Klingon chief engineer on *Star Trek: Voyager*. Here's what she's reading in English.

A Concise History of the Catholic Church, by Thomas Bokenkotter. "I'm interested in the study of religions and how they affect society. There's a lot of ritual in any formal religion, and understanding where those rituals come from – how they often developed in response to political and social events throughout history – can help you understand how and where they can fit into your life."

The Great Divorce, by C. S. Lewis. "This is a philosophical and religious book that describes a soul on a bus ride between heaven and hell. It's about what is good and bad, how we might be judged in the afterlife, and who makes those judgments. Lewis brings up questions without answers, and some of the images are so intense and otherworldly that it takes a few readings to understand them."

SVEN BIRKERTS, author of the antitech tome *The Gutenberg Elegies: The Fate of Reading in an Electronic Age*, suffered nerve damage in his thumb when he read *Infinite Jest*, which weighs in at more than 1,000 pages.

Infinite Jest, by David Foster Wallace. "This book is surpassingly strange and took me a long time to read. It resembles the world of Thomas Pynchon – written not in terms of traditional focus and rising action, but as a sort of distributed system with strange, interlocking extended narrative bits and side roads and little webs, burrowing around in the endless online universe. Wallace has a very black humor that I relate to."



Roxann Biggs-Dawson



Sven Birkerts



Jerry Yang

Life on the Screen: Identity in the Age of the Internet, by Sherry Turkle.

"Turkle has a lucid way of gathering far-flung materials and creating a comprehensive narrative. I learned a great deal about artificial intelligence, parallel processing, and gender bending online. Turkle certainly conveyed the feeling of online communication and included a lot of downloaded transcripts. But set in the context of a book, on paper, between covers, these looked unbelievably slight and idiotic. I don't think a serious book survives well on screen. By the same token, what works well on screen looks inane on paper. The spirit is gone."

JERRY YANG, co-creator of *Yahoo!*, put his electrical engineering PhD on hold in 1994 to work full time at his online guide, which is growing even faster than Moore's Law allows.

Relationship Marketing: Successful Strategies for the Age of the Customer, by Regis McKenna. "I found McKenna's sense of history of business and marketing – especially in the Silicon Valley context – extremely interesting. He talks about building a new world from the old, not just duplicating the old. I like to think that at *Yahoo!* we are building our own market space as we speak."

The Web. "I am mostly digital nowadays – newsgroups, Web sites, and other digital means have replaced my book reading. I don't have time to read newspapers anymore. **Interactive Age** (<http://techweb.cmp.com/ia/dailies/daily.htm>) has an interesting balance of industry tidbits and good technical product releases. And **c|net** (<http://www.cnet.com/Central/News/index.html>) has a more consumer computer focus, with a good entertainment facet to it."

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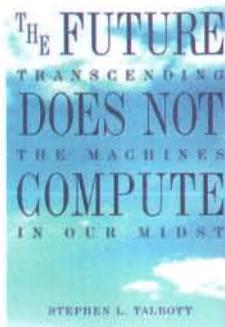


Syntax Terror

When I first laid hands on Stephen Talbott's *The Future Does Not Compute*, I couldn't wait to read it. The cover looked great. The topic – the future of the information age – timely. And the preface, by the president of respected book publisher O'Reilly and Associates, suggested it would "make people think." Yet, I know exactly the point at which this became unimportant.

Page 17. I got to page 17 during a long flight to Sri Lanka and could scarcely read another word. This book's entire message is, get ready: computers are *bad*.

The book is a kind of New Age critique of technology, wrapped in a unintentional



Neither does this book.

parody of philosophy/psychology/sociology. A taste of Talbott's excoriating prose: "Most of us currently interact with our computers via a keyboard and mouse. But we could interact by attaching electrodes to our heads and learning to manipulate our own brainwaves."

If you want something to make you think, read Joseph Weizenbaum's *Computer Power and Human Reason: From Judgment to Calculation*. Hell, even an in-flight magazine on Air Lanka is better.

– Peter Thomas

The Future Does Not Compute: Transcending the Machines in Our Midst, by Stephen L. Talbott: US\$22.95. O'Reilly and Associates: (800) 998 9938, +1 (707) 829 0515.

This Is How They Do It

Most interactive software products are nothing of the kind. Watching animation and video on a computer screen is no more interactive or useful than watching TV. *Learn the Art of Magic*, while no history maker, takes a step in the right direction by teaching its users fun hands-on skills. (Ironically, it also runs roughshod over the age-old credo that "a good magician never reveals the secret" ... but perhaps this reviewer doth protest too much.)

Hosted by lauded magician Jay Alexander – who at 11 stumbled onto an attic trunk full of magic paraphernalia and thus found his calling – the game features videoclips demonstrating stage presentations for a number of classic magic tricks and the secrets behind them. *Magic* has another trick up its sleeve – props that come in the box. Americans love freebies, and this package includes a vanishing box, a mystery dice-and-cup set, special cards for a number of tricks, and more. Users also can take a look at some classic sleight-of-hand involving ropes, rings,



Abracadabra, this game'll reach out and grab ya.

and other materials. Along with the tricks come a gallery of goofy short tributes to master magicians of the past (played by Alexander), a guide to stage magician's lingo, and time-tested visual distraction techniques. A nifty template function allows aspiring young magicians to print posters and tickets for their home-brewed magic shows and certificates when they master the tricks.

Note that I say young magicians. This interactive experience is definitely for children in the 8-to-12 range. While most of the visuals have a sort of subdued magic sideshow motif (many backgrounds are taken from antique magic-show clapboards), Alexander is pure 1983. His cheesy delivery and cornball presence is enough to drive me to aggravated felony assault, but kids seem to dig it.

Magic's biggest accomplishment is that it teaches you tricks you can perform in real life. And if it entertains along the way, well, that's some kind of magic. – Chris Hudak

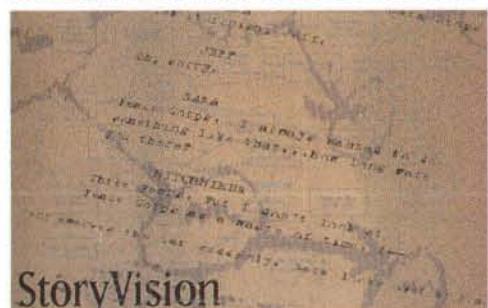
Learn the Art of Magic Windows and Mac hybrid CD-ROM: US\$35. Brøderbund Software Inc.: (800) 521 6263, +1 (415) 382 4400, fax +1 (415) 382 4582.

(En)Visioning Interactive Stories

Once upon a time, all storytelling was interactive. The audience and the teller engaged in a conversation. "Tell us about when Odysseus beat the Cyclops," someone might shout from the back of the room, and the bard would subtly shape the tale to accommodate listeners' murmurs of outrage or approval.

Today such interactions take place in a digital realm where users select their own narrative paths by grabbing data from a CD-ROM or online server. It's storytelling the way it used to be – before print drove it all linear.

Until recently, however, interactive fiction writers and designers have been stuck in the Dark Ages. For years, they've been seeking a flexible tool that can simplify the complex task of creating nonlinear narratives. They've wanted to flowchart stories to be different every time, using parallel, webbed, or branching story lines. They've needed a convenient



StoryVision

Digital bread crumbs for modern-day storytellers.

way to hide and show branching subsections, and to insert text directly into each scene. With StoryVision, the tool is finally here.

StoryVision is a flowcharting program that sits on top of any word processor, making it easy to script each story node as you go along. StoryVision can create narrative flowcharts that loop back on themselves, allowing characters to revisit scenes. It has a browse tool that lets you trace a winding path through complex plot lines to ensure they make sense. You can print flowcharts to follow the narrative, reading it aloud. And you can enter specific instructions to the programmers, such as "This branch is not likely, but possible," on the lines that connect flowcharted scenes.

StoryVision is a neat piece of work – simple, elegant, and direct. Its creators in Santa Monica, California, didn't reinvent the wheel, but they did make it nice and round. – Rob Swigart

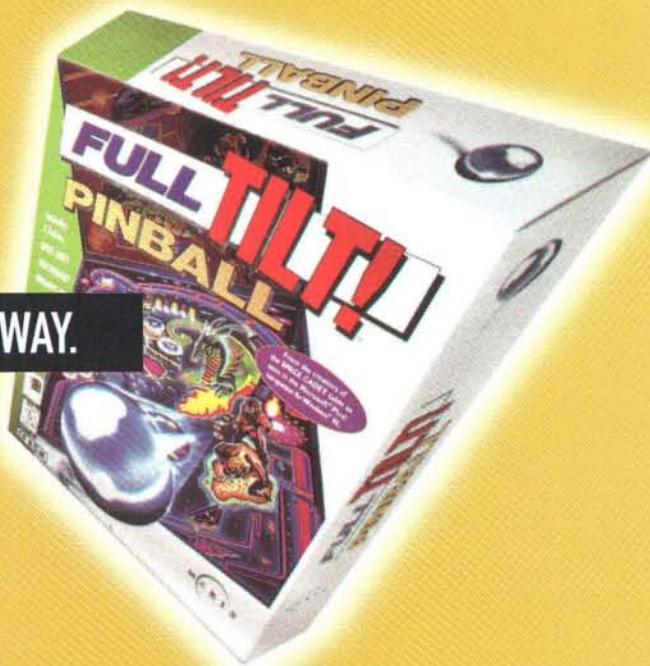
StoryVision for Mac and PC: US\$199. StoryVision: +1 (310) 392 5090, fax +1 (310) 392 7550, e-mail StoryVis@aol.com.



(figure 1)

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(figure 2)

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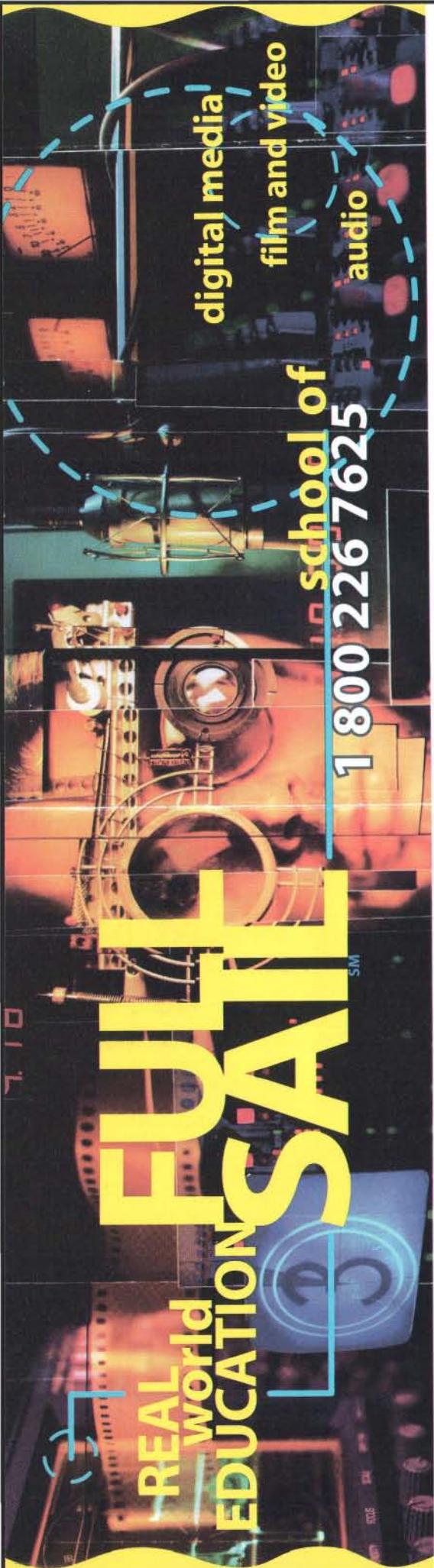
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1. Infowar

Infowar is currently the hottest buzzword in the halls of the Pentagon, describing everything from computer viruses that destroy enemy air-traffic-control systems to teams of hackers trained to spy on foreign powers. The idea is perfectly suited for the post-Cold War defense department: it's cheap (no billion-dollar bombers required), it promotes the illusory possibility of a bloodless war (a PR coup), and it still involves lots of nifty gadgets (boys will be boys). Of course, what's ironic about infowar research is that the only country developed enough to be truly crippled by electronic attacks is the US.

2. www.suck.com

It took years before TV hit on winning formulas, but the Web appears to have already found one with *Suck*, recently purchased by *HotWired*. *Suck*, like *HotWired*'s Flux and *Pathfinder*'s Netly News, offers a smugly written essay every weekday in a simple, easy-to-read format. Sound basic? It is. *Suck* succeeds because it doesn't take risks. It doesn't try to do anything that hasn't been done for centuries. Still, there's something discouraging about the fact that it could be distributed equally well by fax.

This Month's Overhyped Memes	Hype Level	Position Last Month	Expected Lifetime
Infowar	0	0	12 months
www.suck.com	0	4	4 months
Distributed Objects	0	0	6 months
Internet Ratings	1	5	3 months
Tech Art Shows	1	4	6 months

0 = Embryonic meme 1 = Meme on the rise 2 = Mass-media meme 3 = About to die from overexposure

HYPE LIST

3. Distributed Objects

When it comes to technology, the greater the number of acronyms, the higher the bullshit factor. Developers trying to make things sound officious end up using lots of obscure ones. Distributed object technology, with its endless list – ORB, OLE, SOM, IDL – is a perfect example. Like postmodern lit theory, it creates a hermetic vocabulary so incomprehensible to outsiders that no one dares challenge it. But I have hope: unlike tenured professors, consultant advocates can be swiftly fired.

4. Internet Ratings

The World Wide Web Consortium, having failed in its mission to control the technical standards that make up the Web, has decided to try solving social issues. January saw the introduction of PICS (Platform for Internet Content Selection), which allows parents to block access to Web sites rated objectionable. The ratings are provided (read: sold) by third parties such as religious groups or educators. It's a ridiculous scheme (even a 10-year-old could bypass the filter), but I love the idea of religious groups competing to find the most smut on the Net.

5. Tech Art Shows

Art exhibits showcasing technology – VR caves, exploding robots – are again blurring the Warhol-traversed line between products and art objects. But tech "art" has shortchanged computer engineers, just as Andy ripped off the Campbell's soup-can designer. It's the difference between craft and art, perhaps, but if that can be gauged by usefulness versus uselessness, engineers have surely earned their spot in the galleries.

– Steve G. Steinberg (hype-list@wired.com)

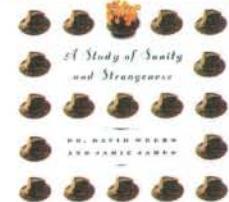
Walk the Walk

Many perfectly ordinary people assert that they're a little crazy. As proof, they'll say they prefer their pancakes with a dollop of peanut butter. Of course, these folks are total wimps on the eccentricity scale. Just ask Dr. David Weeks, co-author of *Eccentric*.

Weeks, an American neuropsychologist and therapist at the Royal Edinburgh Hospital in Scotland, and his associates interviewed more than 1,000 eccentrics across two continents. His study suggests that about 1 in 10,000 people is a "classic, full-time eccentric." They tend to be creative, curious, idealistic, intelligent, opinionated, outspoken, humorous, single, usually the eldest or an only child, and healthier than most people.



ECCENTRICS



Bad spelling is good?

(probably because they're less prone to the stresses of conformity.) Oh yeah: most of them are bad spellers.

Eccentric, which Weeks wrote with journalist Jamie James, is highly entertaining and sometimes moving. The Achilles' heel of Weeks' study, however, may be that the majority of his thousand-plus subjects initiated contact, possibly excluding shy or anti-social eccentrics. As a scientific endeavor, the book is flawed. But as a serious pop-cultural exploration of a little-understood phenomenon, it's a gratifying read.

– Rogier van Bakel

Eccentric: A Study of Sanity and Strangeness, by David Weeks and Jamie James: US\$23. Villard: (800) 726 0600, +1 (212) 572 2843.

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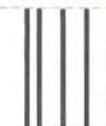
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Cred contributors

Jeff Baskin is a writer and editor living in Santa Cruz, California. He is hard at work on his magnum opus, *Lawrence Welk in Cyberspace*.

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Roger Park (heyrage@aol.com) plays in the funk band Aquaflesh and is editor of the webzine *Phatbits*. His articles have appeared in *Addicted to Noise*, *LA Weekly*, *Yolk*, and *City News Service*.

j.poet is a singer, songwriter, and bohemian whose byline appears in *Pulse* and *Utne Reader*.

Dean Suzuki is a professor of music history specializing in experimental music at San Francisco State University. A critic, journalist, historian, and radio host, he is also writing a book on the evolution of minimalist music.

Rob Swigart, a research affiliate at the Institute for the Future, is the author of eight novels, including *Portal*, available both electronically and in hard copy (St. Martin's Press).

Jeff Swimmer is a filmmaker living in New York. His documentary on the John Coltrane church in San Francisco debuts this spring on the BBC and French television.

Scott Taves (staves@interaccess.com) is the US manager of B&W Music and The Blue Room record labels and author of *Pocket Tour of Games on the Internet*.

Peter Thomas (peter.thomas@csm.uwe.ac.uk) is professor of information management at the University of the West of England. He is a sucker for any bit of technology that has too many buttons.

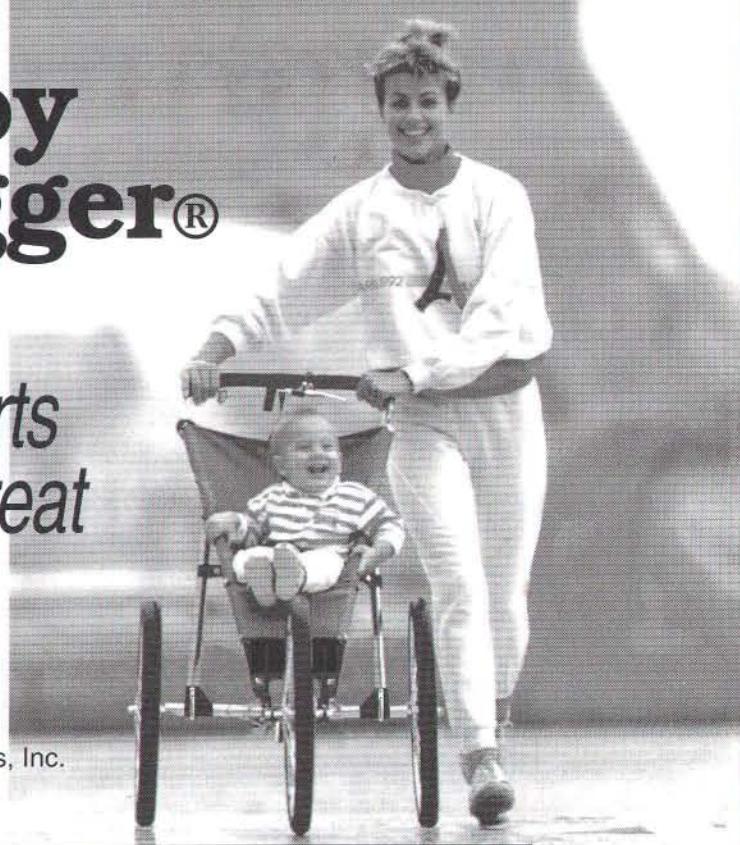
Rogier van Bakel (rogierml@aol.com), as anagram enthusiasts will note, has Brave Ink Galore. He lives in Connecticut.

Brad Wieners (braddog@well.sf.ca.us) writes for *Details*, *Time Out*, and the *San Francisco Bay Guardian*, among other pubs. He will read anything that interests him.

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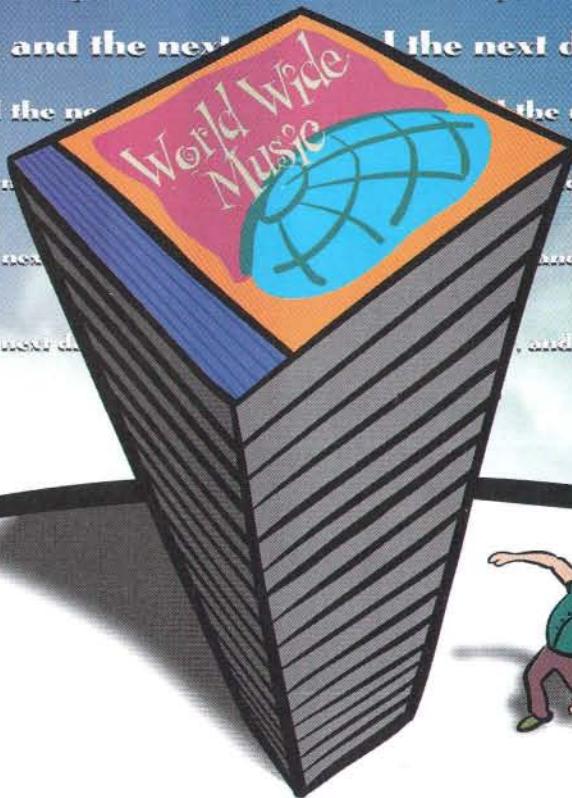
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Taking Off with VRML

Fly through the Web rather than surf it: soar over a computer-generated cityscape, enter a building, visit its many floors. Step through a door and hyperlink to another room, or explore a surrealistic dimension. With *Virtual Reality Modeling Language* (VRML), *homepage* has an almost literal meaning, as you construct your own 3-D cyberdwelling and invite other Web flyers to visit.

That's what VRML promises. But, as in most cases, the technical reality here clashes with the hype. When it works, VRML does best on the superslick, way-fast computing platforms – PowerPC or Pentium systems packed with as many extras (additional memory, hard disk space, graphics accelerators) as you can afford. Even then, a supercharged setup won't guarantee top performance. And because most VRML software is still in beta, flying through the virtual realm via Mac or PC is like learning to pilot a plane ... without instructions. Expect unexpected crashes.

There are nearly a dozen VRML browsers that run on either a Windows-based PC (Windows 95, NT, or 3.1) or a Macintosh with a 68000-based or better processor. Generally, these browsers operate as a helper application to a standard HTML browser. VRweb (<http://www.iicm.tu-graz.ac.at/Cvrweb>) is just such a facilitating program. It's a no-fuss VRML viewer that's user-friendly and simple to use. Additionally, because its programming is relatively stable, VRweb serves as a good introduction to VRML browsing.

Stand-alone browsers include InterVista's WorldView (which can also be used as a helper app) located at <http://www.intervista.com/>, and Silicon Graphics' WebSpace, located at <http://webspace.sgi.com/>. WebSpace is best suited for Pentium or PowerPC computers with a T1 connection to the Net. But perhaps the most convenient browser to use is Paper Software's WebFX (<http://www.paperinc.com/webfx.html>), which embeds itself in Netscape or Mosaic. Both VRML files and HTML pages are handled seamlessly when called up by a WebFX-modified browser.

Playing around with the sample objects that usually come with these viewers – your typical cubes, spheres, tables, chairs – quickly grows dull. You'll want to venture out and do some sightseeing.

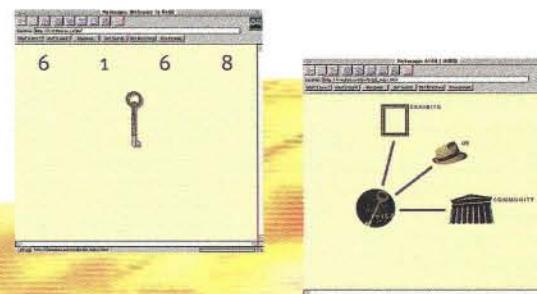
Take a flight over to the Big Apple at http://www.sony.co.jp/TechnoGarage/VRML_sample.html, or trip out to the Left Coast and tour Multimedia Gulch, the mecca of San Francisco digital culture, at <http://www.hyperion.com/planet9/vrsoma.htm>.

One of the most elaborate sites out there is the *Arc Gallery* – à la VRML (<http://vrml.arc.org/gallery95/index2.html>), a multi-floored building complete with furnishings. And if you're in the mood for haute culture, fly to <http://www.crg.ohio-state.edu/~mlewis/Gallery/vrml.htm> and enter a virtual museum of fine art.

Seeing these locales and others may inspire you to set up your own homestead on the VRML frontier. Having the right tools will make all the difference. One tool that allows you to build three-dimensional worlds in VRML is Fountain. It's available free of charge at <http://www.caligari.com/>. Another valuable freebie is Home Space Builder (<http://www.us.paragraph.com/whatsnew/homespc.htm>), which is specially geared for VRML site construction.

As VRML gains popularity, it's an increasing chore to keep track of the latest in software developments. Thankfully, bookmarking the VRML library at <http://cedar.cic.net/~rtimann/mm/vrml.htm> makes virtual life easier. The site maintains the hottest links to VRML software and documentation, as well as sites such as the academic *Chemical Examples of VRML* (<http://www.ch.ic.ac.uk/VRML/>).

While its demand for optimal system performance is heavy, and its programs aren't quite glitch-free, VRML offers what HTML doesn't: the exploration of environments that feel real. So, get your computer flight-ready and experience a new dimension. You don't even need goggles for this one. – Howard Wen (102766.1042@compuserve.com)



A multimedia exhibit with style, 6168 is a beautifully designed hub of art and narrative. Found at <http://mindlink.net/ph/>, 6168's four galleries interactively explore the human condition.

Flick Picks

OK, so you haven't seen a movie in months and your CPC (Cocktail Party Conversation Aptitude) is slipping like Nancy Kerrigan in Lillehammer. You want to spend a weekend catching up in the aisles of Blockbuster, but you don't know where to start. Miramax Cafe (<http://www.miramax.com/>) is here to help. Pop into this friendly looking site put up by the folks who've brought you art-house hits like *The Crying Game* and *Paris Is Burning*. Download clips and stills of all those hip flicks you missed last year. Learn about those newly released movies everyone will be standing in line to see next week. And don't forget to buy a *Pulp Fiction* cap at the Concession Stand. You'll look authentic as you confidently sprinkle your conversations with expressions such as, "I couldn't believe that scene!"

Let's Be Frank

Chairman of the Bored? Guess again, baby. I get no kick from mainframes, but this Web site swings hard. Next time you're tapping away into the wee hours of the morning, drop by the Frank Sinatra Web site, *Ring-a-Ding Ding!* (<http://www.io.org/~buff/sinatra.html>) and have one for the infobahn. It's all happening here – Hoboken, the swooners, those bow ties, The Rat Pack, even reviews of the latest box sets. Look up the lyrics to the legend's songs, which happen to be, well, all the great American standards. Read *Playboy*'s 1962 interview with "the voice that (still) thrills millions." Even cook up a batch of Ol' Blue Eyes's own sugo. Now, that's a good sauce. And don't forget, "It's Frank's Web, We Just Surf on It." Dig?



Biting, intelligent, humorous cultural criticism can now be found on a postage stamp ... and on the Web at <http://www.razorfish.com/bluedot/fire/>. Order a pack of your own and live the dream.

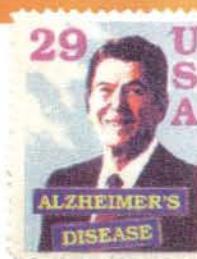


What Is the URLLL, My Precioussss??

Remember: so long as you're staring intently at your computer screen, it looks like you're busy working – even though you may just be trying to figure out the *Riddle du Jour* at <http://www.new3.com/riddle/>. Each day, Riddle presents a new brain twister, chosen by the site's editors from the slush pile of submissions. And, like any Web site worth its salt, Riddle offers the opportunity to win thousands of valuable prizes. Have a joke published – or be the first on your block to answer one – and the booty is yours!

Sponsors pony up nominal goods (one prize was 40 ounces of golden-fried peanuts) in exchange for having their logos and links nestled among the cheesy, fantasy-genre graphics that drape the site. (Apparently attempting to connect themselves with the mythical Sphinx, the eds at Riddle pillaged every *Dragon Magazine* and fantasy-novel cover they could lay their hands on.) The aesthetic fits the content, however, as most riddles tend to be fairly Gothic, with the odd seventh-grade-algebra word problem tossed in for number geeks.

If you've got a few minutes to kill at work (and who doesn't?), surf on over and match wits with the Net – Gollum-and-Bilbo style.



hURL!

It's a well-known fact that the most effective way for any male to reduce his sexual attractiveness is to play air guitar. To safeguard your chastity, the *Easy Air Guitar* homepage (<http://www.digitalrag.com/mirror/air.html>) will teach you the basics, including the "Solo" and the "Windmill." Then let air-guitar legend R. "Bud" Philson strap on his Philson Stratoblast to reveal the secrets of more advanced maneuvers such as Hendrix-style tooth picking, the extended jam, and the standard leap. The chicks will stay away in droves – guaranteed!

They're Out to Get Me ... I Just Know It!

The *50 Greatest Conspiracies of All Time* Web page fills a desperate need in this paranoid era. The promotional site for Jonathan Vankin and John Whalen's book of the same name delves with fervor – and humor – into assassinations, coverups, and infiltrations of all kinds; from Dallas to Waco, Hitler to Castro, and the countless UFO sightings in between.

Start at the blood-red DISorientation screen at <http://webcom.com/~conspire/buttons.html>, where glowing icons deliver you to "juicy new catches" in the conspiracy web, unpublished chapters from the book, or the site's archives. All the acronyms are here (CIA, FBI, JFK, MLK, AIDS) as Vankin and Whalen leave no sinister stone unturned: music buffs can investigate the deaths of Lennon and Morrison; sports fans can defuse a plot to disrupt the 1996 European Championship soccer tournament; the pious

should be piqued by "Eastergate," in which a secret society possesses proof that Christ survived crucifixion. Beyond paranoia, 50 GCOAT will make you LOL – check out titles like *ApolloScam: One Giant Hoax for Mankind*, and *Jonestown: Population Zero*. Twisted? You bet. Download, then forget everything you know....



These ethereal images are only a few of those included on Jill Greenberg's *Beauty?* page – a site that sumptuously delves into the truths, lies, and power of the American beauty myth through text and image. *Beauty* ... as fleeting as the electrons passing through your monitor. Connect to <http://www.chiatday.com/cd.www/invent/art/art.html>.

Uncle Leonard Wants You!

If you're bummin' because you feel your country's not treating you right, cheer up. There's a new nation on the Web, and it's looking for citizens just like you.

Is it Monaco? You can't afford it. Is it Liechtenstein? You couldn't get in there with a shoehorn. Nope, it's *The Hutt River Province Principality*. Located in the westernmost region of Australia, Hutt River Province has declared itself an "independent sovereign state." This dubious assertion of sovereignty is based on a 1970 two-part document that included a formal secession and an offering of the sovereignty to Her Majesty Queen Elizabeth II. Unfortunately, nobody takes the province's claim very seriously – least of all Australia (Hutt River's monarch, Prince Leonard, might even be a bit tongue-in-cheek). But none of this stops the tenacious little nation-state from issuing its own money, stamps, drivers licenses, and passports. All available – plus other neat stuff like knighthoods – for a nominal fee. Hutt River will even let you keep your old citizenship (hey, all the *coool* people have dual citizenship). What have you got to lose? Emigrate to <http://www.net-quest.OntheNet.com.au/Hutt/>.

Cruisin' the SS WWW

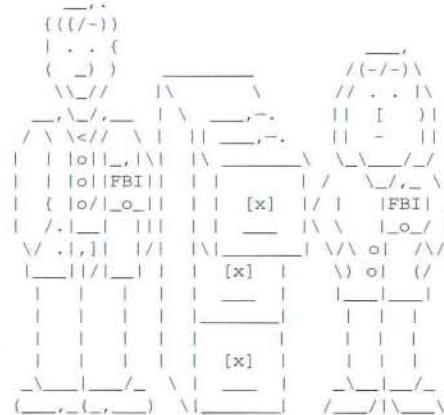
Between December 13 and 25, 1995, the *R. V. Livonia* sailed from Argentina to Antarctica in one of the Web's first Interactive Expedition Exhibitions. To experience the sights, sounds, and science of that voyage and future expeditions, set sail for <http://www.terraquest.com/>. In addition to ship logs, photographs, and movie and audio clips, *TerraQuest* offers points of reference on the geography and wildlife of our southernmost continent, as well as opinions, views, and writings of scientific experts. Upcoming "virtual expeditions," which will feature, among other innovations, live satellite links with the team, include Virtual Galapagos, Virtual Kilimanjaro, and Virtual Everest. No doubt they'll be just as hot, er, cool!

A Postmodern Authentication Tool

So, you've won the contest at a local radio station – a date with Camille Paglia. She comes to your house, whisks you off to a new print of *La Dolce Vita*, then spends the rest of the evening comparing it to *As the World Turns*. You've had a wonderful time, but you also have doubts: Was it really her? Doesn't the real Camille have a girlfriend?

Should this happen to you, seek out the handy *Pagliameter*, at <http://www.cs.tu-berlin.de/~jutta/cpc/index.html>. By filling out a few questions on a checklist, you will be able to tell the authentic academic from an imitator in seconds. The *Pagliameter* is programmed to return appropriate answers ranging from "Someone is pulling your leg" to "That's definitely Camille Paglia." Below the form are a multitude of links to interviews and articles for further study.

German computer science student Jutta Degener designed the page after watching *Larry King Live* – she couldn't tell whether the guest was in fact one of her favorite authors. Now, thanks to Degener, you don't have to settle for phony Paglias.



Random ASCII Art o' the Month

Thanks to the Wired 4.02 Surf Team

Brent Sampson brents@rmii.com
Colin Berry cpberry@aol.com
Todd Lappin telstar@wired.com
Steven Overman steven@wired.com
Bob Parks bobparks@well.com
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Steve Jobs

◀ 107 they're getting worse! Don't you think they're getting worse?

I do, but I was hoping I could come here and find out how they were going to get better. Do you really believe that the world is getting worse? Or do you have a feeling that the things you're involved with are making the world better?

No. The world's getting worse. It has gotten worse for the last 15 years or so. Definitely. For two reasons. On a global scale, the population is increasing dramatically and all our structures, from ecological to economic to political, just cannot deal with it. And in this country, we seem to have fewer smart people in government, and people don't seem to be paying as much attention to the important decisions we have to make.

But you seem very optimistic about the potential for change.

I'm an optimist in the sense that I believe

would somebody be?

Could technology help by improving education?

I used to think that technology could help education. I've probably spearheaded giving away more computer equipment to schools than anybody else on the planet. But I've had to come to the inevitable conclusion that the problem is not one that technology can hope to solve. What's wrong with education cannot be fixed with technology. No amount of technology will make a dent.

It's a political problem. The problems are sociopolitical. The problems are unions. You plot the growth of the NEA [National Education Association] and the dropping of SAT scores, and they're inversely proportional. The problems are unions in the schools. The problem is bureaucracy. I'm one of these people who believes the best thing we could ever do is go to the full voucher system.

I have a 17-year-old daughter who went

I used to think technology could help education. Now my inevitable conclusion is that no amount of technology will make a dent.

humans are noble and honorable, and some of them are really smart. I have a very optimistic view of individuals. As individuals, people are inherently good. I have a somewhat more pessimistic view of people in groups. And I remain extremely concerned when I see what's happening in our country, which is in many ways the luckiest place in the world. We don't seem to be excited about making our country a better place for our kids.

The people who built Silicon Valley were engineers. They learned business, they learned a lot of different things, but they had a real belief that humans, if they worked hard with other creative, smart people, could solve most of humankind's problems. I believe that very much.

I believe that people with an engineering point of view as a basic foundation are in a pretty good position to jump in and solve some of these problems. But in society, it's not working. Those people are not attracted to the political process. And why

to a private school for a few years before high school. This private school is the best school I've seen in my life. It was judged one of the 100 best schools in America. It was phenomenal. The tuition was \$5,500 a year, which is a lot of money for most parents. But the teachers were paid less than public school teachers - so it's not about money at the teacher level. I asked the state treasurer that year what California pays on average to send kids to school, and I believe it was \$4,400. While there are not many parents who could come up with \$5,500 a year, there are many who could come up with \$1,000 a year.

If we gave vouchers to parents for \$4,400 a year, schools would be starting right and left. People would get out of college and say, "Let's start a school." You could have a track at Stanford within the MBA program on how to be the businessperson of a school. And that MBA would get together with somebody else, and they'd start schools. And you'd have these

young, idealistic people starting schools, working for pennies.

They'd do it because they'd be able to set the curriculum. When you have kids you think, What exactly do I want them to learn? Most of the stuff they study in school is completely useless. But some incredibly valuable things you don't learn until you're older - yet you could learn them when you're younger. And you start to think, What would I do if I set a curriculum for a school?

God, how exciting that could be! But you can't do it today. You'd be crazy to work in a school today. You don't get to do what you want. You don't get to pick your books, your curriculum. You get to teach one narrow specialization. Who would ever want to do that?

These are the solutions to our problems in education. Unfortunately, technology isn't it. You're not going to solve the problems by putting all knowledge onto CD-ROMs. We can put a Web site in every school - none of this is bad. It's bad only if it lulls us into thinking we're doing something to solve the problem with education.

Lincoln did not have a Web site at the log cabin where his parents home-schooled him, and he turned out pretty interesting. Historical precedent shows that we can turn out amazing human beings without technology. Precedent also shows that we can turn out very uninteresting human beings *with* technology.

It's not as simple as you think when you're in your 20s - that technology's going to change the world. In some ways it will, in some ways it won't.

WHAT'S GOOD FOR BUSINESS IS GOOD FOR THE WEB

If you go back five years, the Web was hardly on anybody's horizon. Maybe even three years ago, it wasn't really being taken seriously by many people. Why is the sudden rise of the Web so surprising?

Isn't it great? That's exactly what's *not* happening in the desktop market.

Why was everyone, including NeXT, surprised, though?

It's a little like the telephone. When you have two telephones, it's not very interesting. And three is not very interesting. And four. And, well, a hundred telephones perhaps becomes slightly interesting.

W I R E D W A R E



Varsity Jacket

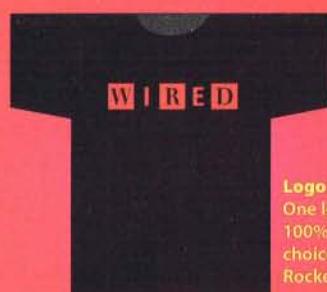
Classic, roomy wool blend/smooth leather sleeve jacket with our sharp, embroidered Street Cred logo on chest. Soft quilted interior for extra warmth and comfort. Wired logo embroidered discreetly below collar on back. Monogram option: we will embroider your name (or alias) to the inside pocket for an additional \$10!



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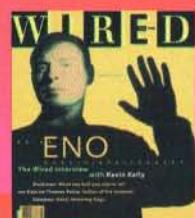
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Steve Jobs

◀ 158 A thousand, a little more. It's probably not until you get to around ten thousand telephones that it really gets interesting.

Many people didn't foresee, couldn't imagine, what it would be like to have a million, or a few tens of thousands of Web sites. And when there were only a hundred, or two hundred, or when they were all university ones, it just wasn't very interesting. Eventually, it went beyond this critical mass and got very interesting very fast. You could see it. And people said, "Wow! This is incredible."

The Web reminds me of the early days of the PC industry. No one really knows anything. There are no experts. All the experts have been wrong. There's a tremendous open possibility to the whole thing. And it hasn't been confined, or defined, in too many ways. That's wonderful.

There's a phrase in Buddhism, "Begin-

eral Express Web site where you can track a package? It took Federal Express about four months to write that program - and it's extremely simple. Four months. It would be nice to do that in four days, or two days, or one day.

The third thing is commerce, which is even harder than complex publishing because you have to tie the Web into your order-management system, your collection system, things like that. I think we're still two years away. But that's also going to be huge.

Last is internal Web sites. Rather than the Internet, it's *intranet*. Rather than write several different versions of an application for internal consumption - one for Mac, one for PC, one for Unix - people can write a single version and have a cross-platform product. Everybody uses the Web. We're going to see companies have dozens - if not hundreds - of Web servers internally as a means to communicate with themselves.

of cash, it's open to vandalism, it becomes obsolete. It takes a tremendous amount of time to manage. And, usually, the car you want, in the color you want, isn't there anyway, so they've got to horse-trade around. Wouldn't it be nice to get rid of all that inventory? Just have one white car to drive and maybe a laserdisc so you can look at the other colors. Then you order your car and you get it in a week.

Today a dealer says, "We can't get your car in a week. It takes three months." And you say, "Now wait a minute, I want to order a pink Cadillac with purple leather seats. Why can't I get that in a week?" And he says, "We gotta make it." And you say, "Are you making Cadillacs today? Why can't you paint a pink one today?" And he says, "We didn't know you wanted a pink one." And you say, "OK. I'm going to tell you I want a pink one now." And he says, "We don't have any pink paint. Our paint supplier needs some lead time on that paint." And you say, "Is your paint supplier making paint today?" And he says, "Yeah, but by the time we tell him, it takes two weeks." And you say, "What about leather seats?" And he says, "God, purple leather. It'll take three months to get that."

You follow this back, and you find that it's not how long it takes to make stuff; it's how long it takes the information to flow through the system. And yet electronics move at the speed of light - or very close to it.

So pushing information into the system is sometimes immensely frustrating, and the Web is going to be just as much of a breakthrough in terms of pushing information in as getting information out.

Your view about the Web is an alternative to the commonly held one that it's going to be the renaissance of personal publishing. The person who can't get published through the broadcast media will get a chance to say something.

There's nothing wrong with that. The Web is great because that person can't foist anything on you - you have to go get it. They can make themselves available, but if nobody wants to look at their site, that's fine. To be honest, most people who have something to say get published now.

But when we ask how a person's life is changed by these technologies, pushing information to customize products 162 ▶

The Web reminds me of the early days of the PC industry. No one really knows anything. All the experts have been wrong.

ner's mind." It's wonderful to have a beginner's mind.

Earlier, you seemed to say there's a natural affinity between the Web and objects. That these two things are going to come together and make something very new, right?

Let's try this another way. What might you want to do on a Web server? We can think of four things:

One is simple publishing. That's what 99 percent of the people do today. If that's all you want to do, you can get one of a hundred free Web-server software packages off the Net and just use it. No problem. It works fine. Security's not a giant issue because you're not doing credit card transactions over the Web.

The next thing you can do is complex publishing. People are starting to do complex publishing on the Web - very simple forms of it. This will absolutely explode in the next 12 to 18 months. It's the next big phase of the Web. Have you seen the Fed-

Three of those four functions of the Web require custom applications. And that's what we do really well with objects. Our new product, WebObjects, allows you to write Web applications 10 times faster.

How does the Web affect the economy? We live in an information economy. The problem is that information's usually impossible to get, at least in the right place, at the right time.

The reason Federal Express won over its competitors was its package-tracking system. For the company to bring that package-tracking system onto the Web is phenomenal. I use it all the time to track my packages. It's incredibly great. Incredibly reassuring. And getting that information out of most companies is usually impossible.

But it's also incredibly difficult to give information. Take auto dealerships. So much money is spent on inventory - billions and billions of dollars. Inventory is not a good thing. Inventory ties up a ton

Difficult music
Startling images
Edgy books, Wild film
Trash TV



We're kick starting a turn-of-the-millennium Renaissance. Zigzag from fringe to

pop as we explore the arts of today through text, sound, video, and images

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HOTWIRED

Steve Jobs

◀ 160 makes marginal differences. You go to the store and there's a lot of different kinds of toilet paper – some have tulips embossed on them and some don't. You're standing there making a choice, and you want the one with the embossed tulips. I like the ones without the tulips. I do, too – and unscented. But that customization is relevant to you for that second but in no other way. For the average person, the possibility to participate as a publisher or a producer has a higher value for them.

I don't necessarily agree. The best way to think of the Web is as a direct-to-customer distribution channel, whether it's for information or commerce. It bypasses all middlemen. And, it turns out, there are a lot of middlepersons in this society. And they generally tend to slow things down, muck things up, and make things more expensive. The elimination of them is

those major change factors that businesses face every decade. This decade, in the next 10 years, it's going to be the Web. It's going to be *one* of them.

But doesn't the Web foster more freedom for individuals?

It is a leveling of hierarchy. An individual can put up a Web site that, if they put enough work into it, looks just as impressive as the largest company in the world.

I love things that level hierarchy, that bring the individual up to the same level as an organization, or a small group up to the same level as a large group with much greater resources. And the Web and the Internet do that. It's a very profound thing, and a very good thing.

Yet the majority of your customers for WebObjects seem to be corporations.

That's correct. And big ones.

Does that cause you any kind of conflict?

Sure. And that's why we're going to be giving our WebObjects software away to individuals and educational institutions

Web can't do word processing. Those things can be fixed later.

There's a window now that will close. If you don't cross the finish line in the next two years, Microsoft will own the Web. And that will be the end of it.

Let's assume for a second that many people share an interest in a standard Web that provides a strong alternative to Microsoft. However, when it comes to every individual Web company or Web publisher, they have an interest in making sure that their Web site stays on the edge. I know we do at HotWired. And so we have to get people into HotJava – we have to stay out there – which doesn't bode well for retaining simplicity. We're going to be part of that force pushing people toward a more complicated Web, because we have no choice.

The way you make it more complex is not by throwing stuff on the client side but by providing value, like Federal Express does, by becoming more complex on the server side.

I'm just very concerned that if the clients become smart, the first thing this will do is fracture the Web. There won't be just one standard. There'll be several; they're all going to fight; each one has its problems. So it's going to be very easy to say why just one *shouldn't* be the standard. And a fractured Web community will play right into Microsoft's hands.

The client-server relationship should be frozen for the next two years, and we shouldn't take it much further. We should just let it be.

By collective agreement?

Yeah. By collective agreement. Sure. Go for ubiquity. If Windows can become ubiquitous, so can the existing Web.

How did Windows become ubiquitous?

A force of self-interest throughout the industry made Windows ubiquitous. Compaq and all these different vendors made Windows ubiquitous. They didn't know how to spell *software*, but they wanted to put something on their machines. That made Windows ubiquitous.

So it just kind of happened.

No, it was sort of an algorithm that got set in motion when everyone's self-interest aligned toward making this happen. And I claim that the same sort of self-interest algorithm is present on the Web. Everyone

We have a two-year window. If the Web doesn't reach ubiquity in the next two years, Microsoft will own it. And that will be the end of it.

going to be profound.

Do you think large institutions are going to be the center of the economy, basically driving it as they are now? Some people say the big company is going to fragment.
I don't see that. There's nothing wrong with big companies. A lot of people think big business in America is a bad thing. I think it's a really good thing. Most people in business are ethical, hard-working, good people. And it's a meritocracy. There are very visible examples in business of where it breaks down but it's probably a lot less than in most other areas of society.
You don't think that structural economic changes will tend to shrink the size of these large companies?

Large companies not paying attention to change will get hurt. The Web will be one more area of significant change and those who don't pay attention will get hurt, while those who see it early enough will get rewarded.

The Web is just going to be one more of

for noncommercial use. We've made the decision to give it away.

SHOOTING THE WEB IN THE FOOT

What do you think about HotJava and the like?

It's going to take a long time for that stuff to become a standard on the Web. And that may shoot the Web in the foot. If the Web becomes too complicated, too fraught with security concerns, then its proliferation may stop – or slow down. The most important thing for the Web is to stay ahead of Microsoft. *Not* to become more complicated.

That's very interesting. Java pushes the technology toward the client side. Do you find that wrong?

In my opinion? In the next two years? It's dead wrong. Because it may slow down getting to ubiquity. And anything that slows down the Web reaching ubiquity allows Microsoft to catch up. If Microsoft catches up, it's far worse than the fact the

has a self-interest in making this Web ubiquitous and not having anyone own it – especially not Microsoft.

Is the desktop metaphor going to continue to dominate how we relate to computers, or is there some other metaphor you like better?

To have a new metaphor, you really need new issues. The desktop metaphor was invented because one, you were a stand-alone device, and two, you had to manage your own storage. That's a very big thing in a desktop world. And that may go away. You may not have to manage your own storage. You may not store much before too long.

I don't store anything anymore, really. I use a lot of e-mail and the Web, and with both of those I don't have to ever manage storage. As a matter of fact, my favorite way of reminding myself to do something is to send myself e-mail. That's my storage.

The minute that I don't have to manage my own storage, and the minute I live primarily in a connected versus a stand-alone world, there are new options for metaphors.

GROKKING DESIGN

You have a reputation for making well-designed products. Why aren't more products made with the aesthetics of great design?

Design is a funny word. Some people think design means how it looks. But of course, if you dig deeper, it's really how it works. The design of the Mac wasn't what it looked like, although that was part of it. Primarily, it was how it worked. To design something really well, you have to *get it*. You have to really grok what it's all about. It takes a passionate commitment to really thoroughly understand something, chew it up, not just quickly swallow it. Most people don't take the time to do that.

Creativity is just connecting things. When you ask creative people how they did something, they feel a little guilty because they didn't really *do it*, they just *saw* something. It seemed obvious to them after a while. That's because they were able to connect experiences they've had and synthesize new things. And the reason they were able to do that was that they've had more experiences or they

have thought more about their experiences than other people.

Unfortunately, that's too rare a commodity. A lot of people in our industry haven't had very diverse experiences. So they don't have enough dots to connect, and they end up with very linear solutions without a broad perspective on the problem. The broader one's understanding of the human experience, the better design we will have.

Is there anything well designed today that inspires you?

Design is not limited to fancy new gadgets. Our family just bought a new washing machine and dryer. We didn't have a very good one so we spent a little time looking at them. It turns out that the Americans make washers and dryers all wrong. The Europeans make them much better – but they take twice as long to do clothes! It turns out that they wash them with about a quarter as much water and your clothes end up with a lot less detergent on them. Most important, they don't trash your clothes. They use a lot less soap, a lot less water, but they come out much cleaner, much softer, and they last a lot longer.

We spent some time in our family talking about what's the trade-off we want to make. We ended up talking a lot about design, but also about the values of our family. Did we care most about getting our wash done in an hour versus an hour and a half? Or did we care most about our clothes feeling really soft and lasting longer? Did we care about using a quarter of the water? We spent about two weeks talking about this every night at the dinner table. We'd get around to that old washer-dryer discussion. And the talk was about design.

We ended up opting for these Miele appliances, made in Germany. They're too expensive, but that's just because nobody buys them in this country. They are really wonderfully made and one of the few products we've bought over the last few years that we're all really happy about. These guys really thought the process through. They did such a great job designing these washers and dryers. I got more thrill out of them than I have out of any piece of high tech in years. ■ ■ ■

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Bangalore

◀ 114 benefits. Free from the stumbling block of old-legacy systems, India leapfrogged obsolete technology. According to Rao, without IBM to dictate computers and programming languages, "there was nothing like a proprietary software base. Everything became open." By default, India became a Unix power.

This period of technological isolation also meant that Indian computer companies were forced to procure indigenous software. A number of unlikely firms jumped into the business. One of them, Wipro, had been a leading producer of vegetable oils, toiletries, and soaps – India's Procter & Gamble. After developing and selling a multiuser system and database program to large companies, Wipro joined the ranks of the Tata Group, India's largest company, which was producing both hardware and software.

PCs made their appearance in India in the mid-1980s, but tariffs greater than 100 percent on hardware forced Indian software writers to create programs that Rao says "extracted every last bit and byte out of small platforms."

Economic liberalization, undertaken in July 1991 by the Delhi government to lighten the heavy hand of state socialism, provided the impetus for American and other multinational companies to return from their 15-year exile. When companies such as Texas Instru-

nies in Bangalore tops 100; some multinationals, such as Novell, spend as much as 5 percent of their total R&D here.

But all is not booming. On four separate occasions during my hour-long chat with Rao, the lights dim and then die. Euphemistically called "load sharing," such brownouts are common in Bangalore. Software houses fill rooms full of generators to take up the slack during these regular power outages.

Rao notes unhappily that lack of power is only one sign of the underdevelopment in Karnataka state. It represents, he believes, the many problems that India will have to overcome before it can take its place as a world-class IT purveyor.

Even more telling to Rao is the lack of top-shelf, noncustom, packaged software coming out of India – the accounting, word-processing, database, and networking products that have made American companies such as Microsoft, Lotus, Oracle, and Novell office (if not household) names. Both Wipro and Tata Information Systems have introduced business products, but they have failed even to win large shares of the limited Indian market – which comprises only an infinitesimal 650,000 computers out of more than 100 million in the world (a particularly bad showing for a nation of nearly 1 billion). India, Rao laments, "has a long way to go in creating a branded software package."

But there is still a glimmer in his eye when the talk turns back to the project-code writ-

other side of the world and the other side of the day. While making global small talk, the Indians arrange themselves around the end of the table farthest from the television.

"Would you like to make the introductions?" the Bell Northern supervisor asks his telecolleagues.

"I'm Ragan, you know me," a young Indian man says self-consciously, beginning the mutual hellos.

"Start presenting," the Canadian team leader suggests. "Who's taking minutes?"

"We'll send them to you," one of the Indians reports back. For the next hour, they critique the software coding for a Bell Northern communications package. Both teams settle in, and soon, seated in rooms 12,000 miles and 11 time zones apart, they begin to feel like they're in the same place.

Which they are. A place called cyberspace.

Today's expanded 435-acre campus of the Indian Institute of Science is the cradle of technological education both in Bangalore and, by extension, in India. It is also one of the few spots in the city that has not been overrun by urbanization. With its lush grounds, stone towers, and red-tiled roofs, the institute could pass for a slightly downscale version of Stanford University.

The comparison between Stanford and the Indian Institute of Science – and between the role each has played in developing regional technologies – is one that the school's director, Govindarajan Padmanaban, eagerly seizes upon as he sits behind his grand piano-sized desk in a dim office in the administration building. "You're right about the analogy," the tiny, white-bearded Brahman agrees. "The institute was a catalyst for many of Bangalore's public, and private, sector aerospace and technology industries."

But the comparison, Padmanaban admits, is also flawed. Bangalore, with its still nascent computer-related bona fides, does not quite stack up to the cradle of technological innovation that is California's Silicon Valley. This troubles Padmanaban. While proud that "most of India's technology leaders" are a product of his institution, the director is perturbed by frozen budgets and shrinking government support. One result is that the institute's 435 faculty members are required to spend one day a week serving as consultants to the government or private industry. "Go to the Bangalore airport," he says

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India's isolation in the '80s led to unforeseen benefits: by default, it became a Unix power.

ments, IBM, Hewlett-Packard, and Intel returned, they found a home-grown expertise in elegant, economical software writing. Alliances were formed between companies such as Wipro and Intel, Tata and IBM, Satyam and Dun & Bradstreet.

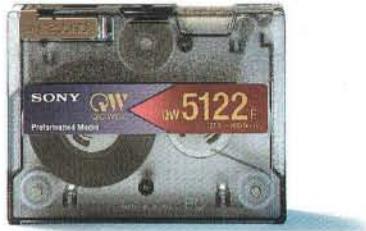
After the government virtually abolished equity restrictions in the early '90s to stimulate India's economy, Texas Instruments, Hewlett-Packard, Fujitsu, Hughes, Sony, Siemens, Deutsche Bank, and others took the next step, setting up their own branches in Bangalore. "A chain reaction set in," relates Rao. "One company came back with a good experience, then a second company, and so on." Today, the number of major IT compa-

ing that is Bangalore's métier. "The software boom continues unabated," he notes with an air of satisfaction.

Later, Rao takes me upstairs to the seventh floor; here the Wipro development team assigned to Canada's Bell Northern projects is about to start a teleconference with counterparts in Ottawa, where it is early morning.

Eight people sit uncomfortably around a long table in Wipro's conference room, staring at a large Sony television, atop which is mounted a PictureTel camera. On the screen, a sleepy Canadian from Bell Northern leafs through a printout, talking to a friend next to him and basically ignoring the fact that he is being watched in real time by people on the

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Bangalore

◀ 164 darkly. "Every flight to Delhi has a professor going to consult."

To Padmanaban, this imposed bureaucracy symbolizes how India has failed to adequately leverage the brainpower of the world's largest English-speaking population. "Our system of education doesn't breed originality at all," he complains, referring to what he calls "the watertight compartments" of Indian schooling. Padmanaban believes that years of rote learning have led to "undergraduates who are so straitjacketed they need to go through a process of unlearning."

"What really happens," he says, "is that all the brightest students in the 12th standard go into medicine or engineering." Padmanaban blames Indian parents for succumbing to social pressures and pushing children into careers that are safe and transferable abroad.

The thing that most galls the director, a devoted man of science, is the tendency for students to receive undergraduate degrees in technology and then go to business school. "Students flock to management education, they just flock toward it," Padmanaban shakes his head, convinced that the current system is not building India's technological base.

Indeed, he downplays the popular notion that India can become a serious technologi-

cal competitor any time soon. India is still a nation "not yet secure it can play the game," he suggests, pointing to the fact that fully half of Indian graduate students coming from the most prestigious universities leave the country after school.

Padmanaban does, however, see hope in a new phenomenon of "people who graduate, don't go abroad, and start their own technology companies here." These small entrepreneurs, he believes, "will want the help of this institution."

Church Street is crowded at lunch time. Dozens of young workers from neighborhood software companies congregate in clots on the busy road. The bachelors are the ones who don't pack lunches: you

can spot them buying their food from *thalivallahs* who carry stacks of nested stainless steel containers filled with steaming *dhosai*. A hundred yards down Church Street on the right is a small white sign whose sailboat logo reads "Baysoft." Through a gate and down at the end of a long driveway is a house, spaciously upper middle class by Indian standards, set incongruously in the heart of Church Street's commercial sprawl. Baysoft headquarters started out in the adjoining garage before expanding to its current office.

The company is largely the creation of Joe Vithayathil, a Bangalore-bred, Harvard Business School-educated Indian software executive who gave up a lucrative Silicon Valley job and a comfortable California life to move his wife and four children back to his childhood home.

A warm, expansive man with solid features, Vithayathil is standing in the yard in front of his garage when he shouts out a greeting to me. Sticking out a large paw, he welcomes me with a firm, American-style handshake.

In 1994, Vithayathil, a rising marketing star at Philips Semiconductors, caused a stir in Silicon Valley when he announced that he was returning to India. His move was an aberration: he was going back to a place that talented Indians with marketable skills

focused on client-server software and named nostalgically after the San Francisco Bay area, his former stomping ground. "What the hell," Vithayathil laughs, recalling his second leap in as many years. "I was having so much fun, I said, Let's do our own company." Tapping Harvard friends (among others) as investors, Vithayathil quickly and privately funded Baysoft.

His timing was fateful. With many business restrictions already wiped out by the 1991 economic liberalization, Vithayathil was certain that the Indian market was "ready to go through the roof." He was already impressed with the work Indian software coders were turning out: "characteristically more methodical, vigorous, structured, disciplined, and according to the rules" than the American version. What was holding the country back, he felt, was philosophy and structure. "Creativity is suppressed here," he often told acquaintances. "People are not allowed to express themselves; they learn by rote."

Vithayathil's vision was to build a business that blended the best of Indian coding with the best of American business values. And Vithayathil's first law, "We don't have employees, we have owners," led to a stock-option plan that pushed the envelope of Indian business practices and regulatory law.

Baysoft began with a human resources plan to find software engineers who were comfortable with a more open and thus less Indian way of doing things. Vithayathil's first move was to hire a human resources company, which in turn came up with some fairly nontraditional, and un-Indian, hiring plans. One of these was to gather together job seekers for an orientation about the company. Baysoft representatives would then excuse themselves, leaving behind a company employee disguised as one of the job seekers. The undercover employee would take notes on the applicants' behavior. "We'd leave and see who spoke up," Vithayathil says about what he laughingly admits was a slightly underhanded tactic.

But the rationale was sound. "People who are more open want to work in a place where they can speak up," Vithayathil says about the mostly younger candidates who passed the test. Once employees were hired, however, there was still an awkward adjustment period for a work force that lived by a generations-old code that Vithayathil expresses as "If you speak up, you're a fool."

His secretary learned a fundamental lesson one day when she presented Vithayathil with the day's stack of mail. Vithayathil handily dismissed the Indian business practice of routing even routine correspondence through the CEO, sending her away with the dictum, "Bring me only what is important."

It was one of many shocking moments in Baysoft's early life. Vithayathil faced even more of an uphill battle dealing with Indian discomfort over confrontation, particularly when it came to quitting a job. The Indian notion of "giving notice" seemed to mean an apologetic call from the airport right before an employee, too embarrassed to tell a boss directly, boarded a flight for an arranged job in the States.

"People are afraid to tell you they're leaving – they won't even spend 15 minutes turning over a project," complains Vithayathil about bodyshopping, which helps account for the nearly 25 percent annual turnover in Bangalore.

When he first returned, Vithayathil learned his lesson the hard way. "I got a letter from an employee saying that his father was ill and that he was going back to his village for a few days," Vithayathil chuckles. "I told my staff that I'd send a bouquet. Everybody burst out laughing." Turnover generally is just one nightmare of Bangalore's software industry. "At 6 o'clock, all your assets walk out the door," Vithayathil notes.

Still, Baysoft continues to win contracts and staff up. After importing a favorite Silicon Valley business practice – running his company out of his garage – Vithayathil is finding himself following in the footsteps of many of his California counterparts: he's moving to a larger compound. Whether this little chunk of Silicon Valley in India is the wave of the future has yet to be determined. But the benefits of starting small and working at home have given Vithayathil one of the shortest commutes in Bangalore and what he claims is "the biggest conference room in the city" – a picnic table set outside in his front yard.

I am having lunch in the home of attorney M. Ram Bhat in the Vasanthnagar district, just north of Vidhana Soudha, the magnificent, and totally noncomputerized, neo-Moghul knockoff that is the Karnataka state capitol building. Bhat is the father of Shiba

Bhat Hariharan, whose husband is a software engineer at Baysoft.

In addition to family, the Hariharans have invited along a friend, Sirajudin Salahuddin, who bills his firm as "The Friendly Consultants." Living in Madras, about 200 miles east of Bangalore, Salahuddin is in the process of setting up a Bangalore office for his booming business: finding people software jobs in major cities all over India and abroad.

An MBA, Salahuddin hit a rough patch after school in Bombay in the early '90s. "I did

outlay of funds for travel, visa, and living expenses, bodies don't really start to make the shopper money until the second or third year. Salahuddin reels off the names of a half dozen other bodyshoppers headquartered in New York, Detroit, and elsewhere in the US.

The bodyshopping arrangement naturally invites employees to jump ship as soon as possible in the States and go out on their own. And, just as naturally, the bodyshopper will do whatever possible to prevent that body from doing any shopping for itself. So

Turnover has become the curse of Bangalore: "At 6 o'clock, all your assets walk out the door."

50 to 60 interviews with no job, so I decided to get people jobs," Salahuddin says with gusto. By placing ads in a number of newspapers and computer publications, he was able to build up a database of software professionals seeking jobs for clients including employee-hungry software houses and overseas bodyshoppers.

Salahuddin quickly caught on to the tricks of the recruiting trade, particularly in the gray world of hiring for US firms. Bodyshoppers procure a recruit's visa applications and pay for travel and housing costs. The "bodies" then go to work for American companies, more or less indentured to the bodyshopper, who takes a fee from an employer and pays the recruit a certain percentage.

Although Salahuddin differentiates his practice from the crasser aspects of the business – "my relationship with the candidate ends the day he leaves India," he tells me – he is well versed in the blacker arts of bodyshopping, having worked with some of the largest bodyshoppers, including Software Technical Services, an Atlanta-based company that brings software writers to the US to work on-site for clients such as IBM, MCI, and Oracle.

According to Salahuddin, high-level software writers are paid between Re88,000 and Re141,800 (US\$2,500 and \$4,000) a month, which is between 25 and 40 percent of what the bodyshopper is paid by the client. And while this is a tremendous salary in India, it is a bargain compared with the pay Americans receive for equivalent work.

Salahuddin does not see this arrangement as unfair in any way. Considering the initial

software writers are often forced to pay a huge indemnity if they break the contract, or they are stripped of their green cards if they leave. Bodyshoppers are not above harassing relatives back in India, either. Sometimes they coax workers into dormitories, the better – and cheaper – to keep an eye on potential deserters. The lowest of the low bodyshoppers charge clients huge amounts upfront or send them to the States without a set job and then pay \$15 a day until they are employed. Salahuddin's advice about bodyshoppers like these: Avoid them.

By contrast, the domestic employment scene is tamer. Placement services inside India take a fixed amount, usually two to three months' salary, to place people in software houses with an overload of work. These aren't bodyshoppers, Salahuddin says, but "business partners."

Salahuddin pulls out several local computer journals containing his ad – and others. Ad after ad requests experience in such highly sought-after skills as PowerBuilder, Oracle, C++, and Sybase. The most prominent ads have something else in common: they include the enticement of working in the US.

No tour of the modern technical culture in Bangalore would be complete without the noisy ride along Hosur Road in an aging, seemingly springless Ambassador, the workhorse Indian sedan that has not changed its style or technology in the last 30 years. The road leads southwest, out of downtown to the new Infosys campus in the Electronics City.

Getting to Infosys Technologies Ltd. 168 ►

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◀ 167 requires a ride through Bangalore's crowded streets, which by midmorning are tinged gray-blue from the carbon monoxide pouring from auto-rickshaws and unmuffled diesel engines, past shantytowns with dogs, sheep, and pigs rummaging freely about the garbage-strewn roadside. The weight of colorfully dressed humanity moving along the road is both oppressive and compelling, as are the endless bazaars and stalls selling shoes, wood, kitchen goods, and everything else imaginable to men in white dhotis and women in orange saris. It is out of this seemingly primordial chaos that a world-class technical culture is trying to evolve.

Even after the morning rush, it takes nearly an hour to reach Infosys, less than 15 miles outside the city. The campus, with its three red-brick and concrete buildings set on five acres of grassland, has been occupied for a year now. But like so much of Bangalore, the stained masonry makes the exterior seem decrepit and unfinished at the same time.

Infosys was the first of the major software houses to leave Bombay for Bangalore in 1983 and also one of the first Indian companies to set up a Silicon Valley-style campus on the outskirts. The long commute is just one sign of how far Infosys, the most western of Bangalore's software companies, has pushed the Indian paradigm.

Notwithstanding the naysayers, Deputy Managing Director Nandan Nilekani insists the adjustment to the new site has been

ing noisily, like college students between classes. Nilekani surveys the scene as he describes the typical Infosys employee: "early to late 20s, from the best colleges, with an engineering background, comfortable with mathematical constructs."

Infosys is betting that younger Indians can continue in the ancient tradition of philosophical inquiry that, Nilekani suggests, "gives us a good comfort level with conceptual things like software," while they also adapt to the wired way of doing business. This dialectic, Nilekani believes, has been bridged by an increasingly adaptable employee base, able to accept new ideas and ways of doing things "without a lot of pre-conceived notions."

"Most Indian software companies are either multinationals or part of a larger company," he says, taking pains to differentiate the young-thinking Infosys from other Bangalore software houses. "Software is all we do." Wandering through Infosys' landscaped courtyard, he ticks off the progressive clients – Reebok, Nordstrom, AT&T, and Nestlé – that have ongoing contracts with Infosys.

Most importantly, Nilekani suggests, Infosys differs from traditional Indian companies in a customer-first orientation impossible in the restrictive, even feudal environment that has been the tenacious motif of Indian business life over the last 40 years. "Those companies got ahead not by satisfying customers but by preempting their competitors with intricate government licensing agreements," he says. Nilekani is neither the first nor the

cant part of our business cycle," is being stripped away. "No question – in the last three to four years, this country has not only changed its laws but also its mind-set."

As an example of one who is breaking the government logjam, Nilekani singles out Srinivasa Varadan, the head of the Bangalore Software Technology Park. "Varadan is more dynamic than most people in the private sector," Nilekani says as he points to the Infosys microwave tower. It is trained on Varadan's satellite Earth-station, one of Bangalore's links to the infosphere.

This critical connection, Nilekani says, makes the Infosys campus an equal to any other wired node on the planet. "We sit here on the Internet, CompuServe, the World Wide Web, with the same real-time connection as New York, San Francisco, and Dallas."

The same Varadan is sitting in his Danish-modern office, two miles from the Infosys campus on the other side of Electronics City. Outside his window is a pastoral scene: goats graze contentedly while, in the distance, workers use rudimentary tools on a construction site. Varadan, a tall, elegant man with slim hands and a crooked smile, is explaining how the concept of the Bangalore Software Technology Park has changed since its 1991 inception as a scheme to promote IT start-ups by providing discount office space, computer time, and satellite links, along with incentives such as duty-free import of computer equipment.

"Originally, the STP started out as a physical entity, which meant you had to hire space and do your software exporting from here," he explains. "But because technology changed so rapidly, we had to adapt to suit conditions," he says about the concept of the "virtual STP."

"Now," he says, "they can stay where they like, and we can provide them with the same benefits from here."

Necessity – in this case the gridlock that made it highly undesirable to locate this far outside Bangalore – may be the mother of reinvention: here the result works especially well. "We realized the entire business of software depended on how fast you communicate with the outside," admits Varadan. "We said, We'll create that infrastructure and let people stay where they are."

Companies within a 30-kilometer radius

"We have the same real-time connection as New York, San Francisco, and Dallas." – Nilekani

fairly smooth – aided by a trio of blue Infosys buses parked in a bare dirt field to shuttle employees back and forth from town.

Nilekani, one of Infosys' seven founders, takes me on a tour of the landscaped campus, a handsome site containing a gym, basketball and volleyball courts, a large library, a videoconferencing center, and classrooms named after Nobel laureates. Its computer room is stuffed with NT and Sun servers, an IBM RS/6000 Unix system, and two Hewlett-Packard 9000s.

Dozens of young Infosys employees move through the high-ceilinged hallways convers-

last to characterize as pernicious the dance between the government and generally well-established companies.

Nilekani tries to answer the critical conundrum of why India, with its deep traditions of education and English-language skills, has had such difficulty absorbing First World business practices and technology when similarly endowed cultures, such as Singapore, have done so well.

Part of the answer, he tells me, lies in a static, don't-take-risks attitude. He also believes that one of the major problems, a "government impedance that was a signifi-

can now simply aim their microwave antennae toward the STP and connect by satellite uplink to clients anywhere in the world. And only a few of the 120 companies taking part in the STP scheme are now located inside the park.

Varadan, a graduate of the Indian Institute of Science, is one of a new, and still rare, breed of government officials who have taken the 1991 economic liberalization seriously. He works for the Department of Electronics, possibly the one Indian federal entity that has done the most to throw off the numbing history of entrenched bureaucracy. Varadan throws the compliment back at the businesses he supports: "The software industry has made the best use of this liberalization of any industry in India," he says.

Like many Indian scientists, Varadan has a strong mystical bent and is a devotee of Ganesha, the elephant-headed son of gods Shiva and Parvati. "Ganesha takes care of obstacles," he says, sounding both proud and a bit embarrassed. "Every day, I get up and pull a card with Ganesha from the cupboard. I do it religiously" – he pauses to laugh – "to overcome obstacles."

As we make our way out of his office for a tour of the STP network operations building, Varadan suggests that the Hindu religion is at least partially responsible for the Indian propensity for writing software. "Software is like following a religion," he says. "From the beginning, you learn to be systematic in your approach to both software and Hinduism." He may have a point. Indian holy books suggest that there are 330 million Hindu devas, or gods – around the number of lines of code written in Bangalore in a good month.

We walk behind the STP building across a windy plain and through a wrought-iron fence into the network operations complex. Outside are two satellite dishes – one for the domestic Insat system and the other for the international Intelsat consortium. Inside the center is a mission control with glass panels protecting US-built computers and switching devices; a series of monitors controls the uplink and network connections.

Five of Varadan's assistants are on duty inside. Not hugely busy, they gather around to watch a demonstration of satellite access to the Internet on a Sun Netra server. They show me the STP homepage and then troll through cyberspace, finding the White House homepage, People magazine's "Celebrity

Weddings '95" cover, and a live multicast from NASA in Houston. Pictures and sound crackle over the ether: "This is mission control Houston. On-time landing for the Shuttle Endeavor is predicted for 6:53 a.m."

Varadan is impressed with the display. And a little miffed. "I wish we had shown this to the minister when he came to visit yesterday," he says sadly, shaking his head.

There is something strangely familiar as I walk through the angled, cutout atrium of one of Bangalore's newest, plunkest office buildings, on the road to the airport. It is afternoon, and the young men coming back from lunch move together in groups. They seem, somehow, to belong to-

Midwestern executive tones. "We see the world in the same way; I can predict how Tata will respond to issues I raise."

One of the things IBM and Tata agreed on when they began TISL was that Bangalore was the right place to be. "To a lot of Indians, Bangalore is ideal," says Whiting. Also chair of the American Business Council in Bangalore, Whiting sees tremendous similarities between the current software rush here and the 1960s Southern California aerospace boom when, he recalls, "engineers went from Northrop to McDonnell to Lockheed and back to Northrop."

Whiting laughs impatiently as he modifies the analogy. "Actually," he says, "Bangalore has the characteristic of the US's freewheel-

Says Varadan: "Software is like Hinduism. From the beginning, you learn to be systematic."

gether. You add it up: clean-cut faces, dark suits, white shirts, rep ties, backs appropriately straight. Actually, you spell it out: I-B-M.

I am on my way up to the seventh floor and a meeting with John Whiting, who is a pleasant, white-haired, Gary Cooper look-alike, an IBM lifer on temporary assignment as president and managing director of Tata Information Systems Ltd.

TISL is a co-venture between Tata, the IBM of India, and IBM, the Tata of America. Begun in 1992, it marked IBM's official return from exile. When I slip, suggesting that IBM had been invited out of India, Whiting interjects pointedly: "The government changed the rules. IBM had the opportunity to stay; we chose not to."

Nor was the choice of Tata – India's largest, most prestigious company – as a partner coincidental. "When we came back, we wanted a quick start," Whiting says. "It made more sense to form a joint venture, especially because we know that Tata is very compatible with IBM."

Whiting – whose comfortable rosewood office, with its recessed lighting and subdued art, could as easily be located in Armonk, New York, as in Bangalore – is happy to tell you why Tata and IBM make such beautiful music together. He mentions Tata's chair. "The first time I came out to India, I met with Ratan Tata, and we saw the business in similar terms," Whiting says in flat,

ing Wild West, with its freedom and looseness." He is not altogether pleased with those qualities – and even less pleased about a recent raid by Sun Microsystems. "Sun opened in January, 1995, and hired my vice president of marketing as managing director. He took four people with him."

"It's one of the things I have trouble with," Whiting admits. "At IBM, we have cultural loyalty up and down. Here, I wonder where the loyalties are." There is just a touch of malice in Whiting's voice as he laughingly suggests that unlike the US aerospace industry of the '60s, "the door may not swing both ways. We don't rehire."

In any event, TISL is growing so fast pin-pricks are quickly forgotten. "Fine," he laughs, "the same month the four left, I hired 50."

Whiting likes the cut of the people TISL has hired in recent months. And he sees a budding sense of entrepreneurialism he thinks may pull India out of the contract-software doldrums. "They have a real interest in going out on their own," he says. "The kids who join us tell us that they want to be here five to eight years, then head up their own software company."

This is where Whiting believes the country must head. "India needs to get into more products. Products are more financially rewarding and riskier," he says. "For every successful product, there are a dozen or more not accepted." **170 ►**

Bangalore

◀ 169 "But where will that creativity come from?" I ask. "Creativity comes from a need."

Whiting thinks for a moment. "It is a spontaneous insight," he answers. "They saw the need and offered a solution. But it's hard to predict from where it's going to come."

It is my last night in Bangalore, and until now, I have privately engaged in a fruitless search for someone who might fit the mold of a Bill Gates, a Marc Andreessen, or an Indian version of Singapore's Sim Wong Hoo of SoundBlaster fame. I have scoured the floors of Connectivity India – a conference sponsored by MicroLand, the budding, business-oriented CompUSA of India – for my technoprotagonist, only to find an utter absence of the teenage computer jocks who haunt computer fairs, whose presence is synonymous with high-tech First World status, who act as shock troops for each succeeding wave of computer technology.

I have learned one reason for the dearth of computer-crazed kids in India: the lack of a reasonably priced Indian PCs. With computer hardware tariffs only recently down from a staggering 120 percent, the prospects that India will be energized by the same kind of personal computer revolution that swept the US in the late '80s seem remote. And though India has a huge middle class, the rupee

might create the insanely great products to blast Bangalore out of its golden porting-and-patching software-project ghetto.

Then I hear of Bharat Goenka.

He works in a woody, comfortable office in the downtown Raheja Arcade shopping center for a company with the totally unmarketable – if intriguing – name of Peutronics Pvt. Ltd. Goenka is a virtually self-taught developer who has created Peutronics's best-selling product: a ledger-accounting software package called Tally that has the ability to seamlessly interpret and adapt to a wide variety of product classifications and inventory specifications. India's leading accounting software package, Tally claims a 45 percent market share, compared with 32 percent for EX, which is produced by the venerable Tata.

I arrive at Goenka's office at 6 p.m., only to find that he is still at home, just waking from a day's sleep after having been at the computer all night. Within 10 minutes, the shambling, shy, self-deprecating creator of Tally is sitting across from me on an office couch, explaining how he came to create India's sole shrink-wrapped hit. "Don't mind if I look a little silly," he tells me as he scratches his heavy beard and looks down at his open shirt and sandals. "I'm not a marketing kind of guy."

After a relatively undistinguished college career, Goenka, now 34, began working for the family textile-supply business. Interested

in four to five hours"), Tally is run in more than 12,000 Indian businesses. Close to 50,000 units of Tally's 13 upgrades have already shipped, and a version 5.0 has just been introduced. Spurning a buyout offer from Tata ("it didn't have a good gut feel"), Goenka and his family were content to allow the product to grow on its own with little marketing or advertising.

More interested in the technology than the business, Goenka is happy to let his father run Tally's day-to-day operations while he concentrates on improving the software. "I will be unhappy if we don't deal with technology," Goenka suggests about Peutronics's prime directive.

"His father will be upset if they're not interested in market share," a colleague pipes in.

"We intend to be aggressive in the next three to four months," Goenka admits sheepishly, mentioning that Tally will be available in the United Kingdom by mid-1996. But doubt creeps into his voice when he mentions finding a partner for the American market. "If we do a bad job introducing it," he hedges, "we won't have a second chance."

Goenka is eager to see India get its chance to become a world IT player, but his doubts simply seem magnified when he begins to talk about India. "India doesn't believe in itself, so how can you expect customers to believe in the industry?" he asks. As an example, he cites the unwillingness of hardware and software suppliers to keep items in stock. "It's a joke," he says. "A big dealer picks it up in lots of 100."

He admits to feeling a little bit exposed when big Indian companies such as Wipro and Sonata have tried and failed to make successful software products. But he attributes those failures less to the quality of the product than to the fear of putting money into a venture that might fail. How much safer it is, he suggests, to invest in the far less risky business of writing contract software.

"If you believe that all you're good at is low-cost programming conversion," Goenka continues, "why get into products?"

Unsure that things will turn around any time soon, Goenka blames this technological failure of nerve on what he calls The Indian Conundrum, a deeply ingrained belief in the finality of karma.

"Will this be Bangalore's epitaph?" I ask. Goenka shrugs. "You can't be bigger than you were meant to be." ■ ■ ■

Where's the hacker who might blast Bangalore out of its porting-and-patching ghetto?

equivalent of US\$2,500 is hard to come by for any but the upper-est of upper-middle-class Indian households.

I can't even find traces of the lust for computer horsepower that is a feature of wired life in the US, Japan, Singapore, and other First Computer World nations. When I ask one young software graduate if she would like to have a computer to take home, she looks at me as if I were one of India's shockingly neglected dogs. "I never had a computer of my own," she sniffs. "Why carry office work home?"

Instead I have found those who are at their roots canny, conservative businesspeople. It has come to seem fruitless to cast around for the kind of anti-establishment hacker who

in computers, he went in search of inventory software he could adapt to the varying and arcane lengths, measures, and weights used for cloth and silk in India. Goenka didn't like what was on the market: "What we saw was deplorable," he says.

Self-described as the family's black sheep, Goenka put his autodidact's software skills to work and in a matter of months came up with the product he named Tally. With family money, he introduced it in 1988. Although the Goenkars had been selling textiles for 35 years, by 1990, word of mouth had made Tally so popular that textile operations were shut down in order to concentrate on the software accounting package.

Easy to learn ("I offer to train accountants



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Catching Kevin

◀ 123 number was, but he could tell me if it was the same as some other number under certain conditions.

What I could say was, "Do you see this call at this time?" I took two lists: the Netcom list of dial-in numbers from around the country and the summary of gkremen's login sessions.

"On Friday at 15:29, do you see a call to (404) 555 7332, duration approximately 44 minutes?" The number was one of the public Netcom dial-up numbers in Raleigh.

"Yes, I have that."

"Do you have a call of duration 49 minutes at about 20:22 your time on Friday to (612) 555 6400?"

"I have it."

"Do they both come from the same MIN?" I asked.

"Yes," he replied.

"Do you have a phone call on February 11 at 02:21 to (919) 555 8900?"

"Yes, I have that one, too."

I asked the same question with five more logins taken at random. In each case the answer was the same: they'd been placed from the same cellular telephone number. Occam - the 13th-century philosopher who advocates the simplest solution to a problem as the correct one - was right.

"So where is it?" I asked.

Murph walked across the room to a map of Sprint's Raleigh cell sites.

All of the calls were coming from cell number 19, located on the northeastern outskirts of the city, near the airport. We now had another important piece of information: Mitnick was at a fixed location. I thought it was unlikely that the calls would be made while he was driving, but I had been worried that he might be changing locations with each call.

"Do you have sector information?"

I asked. Some cellular systems can determine which direction the calling phone is actually located in relation to the cell site - that is, the particular transmitter-receiver tower in a certain area.

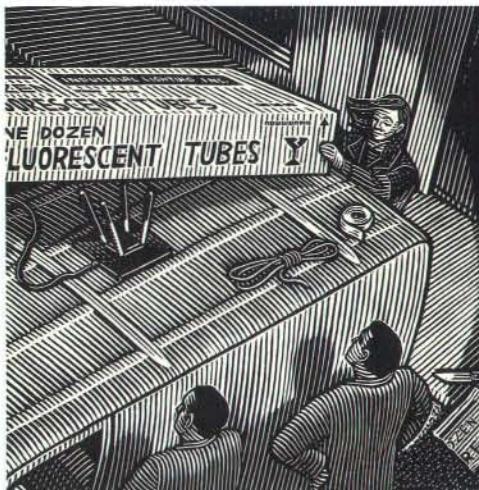
"No, we don't have that information, but to the east of the cell site is Umstead State Park and to the northwest is the airport. My guess is he is transmitting from some-

where south or west of the cell, based on the locations of our other cells."

It was almost one in the morning. By the time we were through, we had his location narrowed down to a radius of less than a kilometer.

"I'll fly out first thing in the morning," I told him.

I arrived in Raleigh on Sunday afternoon, and early the next day I was joined by a friend, Julia Menapace. At 7:30 a.m., just as Julia and I were preparing to leave the hotel, I received a call from Mark Seiden, a computer-security expert who had been helping me with my investigation and was continuing to monitor events



The FBI agents thought Mitnick wouldn't recognize their spy antenna.

Shimomura knew better and hid it with a cardboard box.

at InterNex, a California Internet service provider. He sounded worried. Kevin Mitnick had again broken into InterNex less than an hour before, and it was evident that he knew something was up. "Looks like he's added an account called Nancy, deleted Bob, and changed a lot of passwords - including mine and root's [the system manager's account with all system privileges]," Seiden said. "This looks vindictive. He's getting destructive now." And, in a show of spite, Mitnick had made *New York Times* reporter John Markoff's account accessible to anyone on the Internet. He had changed the file permissions on the reporter's account, meaning that anyone who connected to InterNex could read Markoff's electronic mail.

When I called to check in with Andrew

Gross, the University of California at San Diego graduate student who was working with me monitoring at Netcom, he said that he, too, had watched Mitnick's session on InterNex, and that Mitnick was clearly acting paranoid. After leaving InterNex, Mitnick had next gone to check an illegal backdoor on Netcomsv - a server used for reading network news - that John Hoffman, the Netcom hardware engineer, had closed on Friday. Discovered several days earlier, it was only one of several of Mitnick's ways into Netcom, but he now seemed truly suspicious to find this particular entry barred.

Mitnick's next action, according to Gross, was to head directly to another Internet site we hadn't seen him use before, operated by the Community News Service in Colorado Springs, where he had a spare copy of test1 salted away. This was the program that allowed him to use Netcom as a base of operations without leaving an easily traceable record. It appeared that Mitnick brought back this fresh copy of test1 to compare with the one he already had squirreled away on Netcom, presumably to see if we had doctored the Netcom version so that it might no longer hide his tracks. Comparing the two copies, he found the Netcom version intact. He was using an account named Wendy on Netcom with a password "fuckjkt."

"Who's jkt?" Gross asked.

"I have no idea," I said impatiently.

Gross then described a series of activities that were fairly routine, by Mitnick's standards, which indicated to us that once he had verified that his copy of test1 had not been tampered with, he had begun to calm down, perhaps concluding that the one barred backdoor was a fluke, having nothing to do with his problems at InterNex. Or so we hoped - at this stage in the game, it was becoming hard to tell what was calculated and what was coincidental. After a few minutes, Mitnick had headed back to InterNex, and Gross stopped watching him. We could tell Mitnick was trying to see if he had been detected and if so, where.

"He's still on, so that's good," I said.

"But he's suspicious. That's exactly what we don't need. After all the prodding I've been doing to get the FBI's radio surveillance team here, it would be really

embarrassing for him to go radio silent for a week."

On Monday night, Levord Burns – an FBI agent based in Washington, DC, who was responsible for tracking computer crime – finally showed up. We met at the Sprint cellular switch and then went out to dinner with a group of Sprint technicians. Markoff had arrived in Raleigh and he was also at the dinner. At one point, Burns went off to a pay phone to return some pages. While he was gone, we moved to the topic of Mitnick's social engineering, and I recalled how he had tried to social-engineer me at Los Alamos.

"We've had a problem like that just in the last couple of weeks," Murph said, surprised. "Somebody called one of our marketing guys pretending to be a Sprint engineering employee, and he managed to talk the guy out of several MIN-ESN pairs."

"You don't happen to remember what name the caller used?" I asked. Murph turned to Joe Orsak, a Sprint engineer. "Do you remember?" Neither did. "Was it Brian Reid?" I offered.

"Yeah, that was it," Orsak said.

"Kevin!" John Markoff and I said in unison. What an amazing creature of habit – to stick to the very name he had used on me several years earlier. The real Brian Reid was now an executive running DEC's Internet networking business.

The Sprint technicians were clearly chagrined to learn that Mitnick had weaseled information from their company. It wasn't their fault, but it was a point of honor with them that they ran a secure shop, and they were newly irritated by their colleague's lapse.

The more our conversation focused on Mitnick, however, the more nervous I became. If we'd had good operational security, we wouldn't have been having such a discussion in a public restaurant. I looked behind me and noticed a Middle American-looking couple sitting in a nearby booth, obviously interested in us. This made me even edgier. I began asking the Sprint guys technical questions to steer the talk in another direction.

Later that night, the FBI radio surveillance team from Quantico, Virginia, arrived at the Sprint cellular telephone switch office. The team talked to me a little about

the technology they had toted along in the station wagon, especially something called a cell-site simulator, which was packed in a large travel case. The simulator was a technician's device normally used for testing cell phones, but it could also be used to page Mitnick's cell phone without ringing it, as long as he had the phone turned on but not in use. The phone would then act as a transmitter that they could home in on with a Triggerfish cellular radio direction-finding system that they were using.

Clever as the technique sounded, I pointed out that it might be risky to use on Mitnick. "You're dealing with someone who has source code for all sorts of cell phones," I said. "He might be able to detect it."

They conceded that it might not be worth the risk, and their look added an unstated, Go away kid, you're bothering us. I don't think they liked the idea of dealing with a civilian, particularly one who was in a position to learn all about their techniques.

Fred Backhaus, one of the technicians,

he's been known to use scanners to monitor the police before," I said. "He's wire-tapped the FBI in the past."

They didn't want to talk to me at all now, but I wasn't going to give up. "No, this is ridiculous," I said. "You guys are going to park out there, and he's not stupid. I'm sure he knows what a direction-finding antenna looks like."

They didn't buy it. "It's not that visible," the short agent replied. I looked at it ruefully. "Can't you put it inside?"

"No, that would degrade the performance," the taller one said.

"Why don't we put a box on top of it?" Murph suggested.

"No, that would be too obvious," the taller one said. I looked again at the top of the van, which had two parallel rails running across it from side to side as a carrying rack. What we needed was a box that looked as if it was meant to be carried there.

"Wait a minute," I told them. "Murph,

"He understands telephone and computer technology a lot better than the law enforcement agencies pursuing him."

had by now backed up his van to the front door of the Sprint building, and the agents began moving back and forth between their station wagon and the van, installing their gear. The Triggerfish direction finder, a rectangular box of electronics about a half a meter high controlled by a PowerBook, was placed in the center of the van's back seat. From one of the agents, who was sitting in the van calibrating the unit, I was able to extract that the Triggerfish was a five-channel receiver, able to monitor both sides of a conversation simultaneously. Next they strung a black coaxial cable out the van's window and ran it up to the radio direction-finding antenna they had placed on the roof. The roof unit had a black base, about 30 centimeters square and several centimeters thick, which held four long silver antenna prongs, each nearly 30 centimeters high, reaching skyward.

This apparatus seemed none too subtle, and I pointed out again that they weren't dealing with some technically illiterate cocaine dealer. "This guy's paranoid, and

you have fluorescent lights. Do you have any of the boxes they come in?" We were in luck; they were in a storage locker off the switching center's main room. We came back out with a 2 1/2-meter-long box that could be lashed on top of the van. I cut a hole in it so it could be placed over the antenna, completely hiding it in case Mitnick was in an upper-floor apartment and might see the van from above.

After we were done lashing and taping the box, the vehicle looked like a respectable electrician's van. The agents had agreed to the camouflage mainly to humor me, but they had to concede that the disguise worked pretty well.

It was nearly midnight when the three FBI agents were ready to roll. "So what happens if we see him outside his apartment?" one of them asked. It seemed probable that Mitnick would shop in the strip mall across the road from his apartment complex. "Do we grab him?"

"He's a probation violator, so we can take him in," Burns said, "but would any of

you recognize him on sight?" The photos that all of us had seen were old, and the FBI documents indicated that his weight had fluctuated.

We decided that it seemed unlikely they would get further tonight than simply identifying which apartment was his, so the FBI team left with Backhaus, while Orsak and Burns followed in my rented green Geo, which they decided was the least suspicious vehicle in our fleet. Burns said they would do a quick surveillance and be right back.

By early the next morning, they had narrowed Mitnick's location to a group of apartments. However, because the signal was reflecting off an apartment wall, the agents were still not certain in which apartment the fugitive was located.

Shortly past 4 p.m. the next day, Tuesday, Julia and I finally reached the US attorney's suite. We had to wait for a while for John Bowler, an assistant US attorney,

why things aren't moving more quickly. He's managed to elude the bureau for more than two years, and it looks as if they're giving him every opportunity to get away again."

"Is he armed, or is he dangerous in any way?" Bowler asked. I said I doubted that he was armed, but that he was dangerous in unpredictable ways. Whether or not he would actually wield that power, at the moment he was in a position to damage computer systems used by tens of thousands of people and containing property worth hundreds of millions of dollars. Several Internet companies were operating at considerable risk in an effort to help us catch this criminal and were not likely to keep exposing themselves much longer. Both The Well and InterNex knew the intruder had root access on their computers, and they had agreed to do nothing while I attempted to track him.

"Mitnick isn't your ordinary criminal," I said. "This is a game to him, and he

was watching him, and had he decided to take them with him if he himself was about to be taken down? What were they risking by not shutting their systems down or locking him out immediately? "What's going on here, Tsutomu? Is he trying to get revenge?" Katz asked.

"We haven't done anything to turn Mitnick against The Well," I answered honestly. "We're this close to getting him," I said. "Give us a little more time."

While I didn't think Mitnick had any reason to believe The Well was on to him, I couldn't say the same for Netcom. I phoned Gross, who reported further signs of paranoia from Mitnick. He was continuing to move his data stashes and change passwords, and as a gesture of contempt for all who cared to review the log files, he had attempted to log into Netcomsv with the password .fukhood, no doubt for Netcom system administrator Robert Hood's special attention. Unfortunately, there was also an indication that Mitnick was suddenly approaching The Well with new wariness: the "dono" account, a secret account he had created and which he had been using for weeks with the same password, fucknmc, now suddenly had a new password. There may have been some hidden meaning in the choice of dono's new password - no,panix - but what mattered far more was that Mitnick had apparently felt a need to take a countersecurity measure at The Well, even though it turned out to be an ineffectual measure, given the level of our surveillance. Had something, or someone, tipped him off?

Officials at The Well were concerned that Mitnick might have turned vindictive, intent on permanent damage.

to finish a meeting, before he came out to the reception area, introduced himself, and invited us into his office.

The prosecutor, a balding man in his early 40s, had a toothy smile and a rosy-cheeked, almost mischievous demeanor. We sat down in two chairs in front of his desk and began to explain our reason for turning up at his office late on a dreary Tuesday afternoon.

"How much of this do you already know about?" I asked. "Very little," Bowler answered, but he seemed intrigued that two California computer hackers had wandered into his office with a tale to tell.

I told him that we were pursuing Kevin Mitnick, who was wanted by the FBI and the US Marshal Service, and I gave him as precise a rundown as possible of the events of the past weeks, up through tracing Mitnick to the Player's Club apartment complex on Sunday night.

"The FBI has been in town since last night," I said, "and since we all now know where Mitnick is, I don't understand

understands telephone and computer technology a lot better than the law enforcement agents pursuing him."

Soon Bowler was busy pulling together documents and delegating tasks to two assistants. As they were working, I received a page from Hua-Pei Chen, a technical manager at The Well.

"Something new has happened," she reported when I reached her. Mitnick had destroyed some login accounting data, she said, and while they had been able to recover it, Well officials were concerned that he might have suddenly turned vindictive and would now aim to do permanent damage. "Tsutomu," she said, "our management is worried about leaving ourselves vulnerable like this."

I phoned Bruce Katz, the online service's owner, who recounted what Chen had told me about the deleted accounting file. "Tsutomu, I want your advice," Katz said. "How vulnerable are we?"

Katz raised a series of questions. Had Mitnick figured out that The Well's staff

Finally, shortly after 7 p.m. in Bowler's office, we had the warrants assembled. Since Burns had gotten no further on narrowing the address list, the assistant US attorney bundled up all four packets, and we headed off for Federal Magistrate Wallace Dixon's home.

While we waited in the car in front of his house, I decided to use my cell phone and send a message to Gross's pager: the ready code we'd agreed upon, which turned out to take some doing. We had set up a code to alert Gross that the arrest was being made, and Kevin Mitnick's birthday was supposed to be the "get ready" signal. I wanted to bracket the number 080663 with dashes, to make clear at a glance that

this was not a regular phone number. On many numeric pagers the dash is created by punching the * key, but when I entered the combination *080663* followed by the # key to send it, I got a fast busy signal, indicating some sort of error. After I tried it again, with the same result, I entered the code number without the dashes, and after it was successfully transmitted, hoped Gross would interpret it correctly.

Unfortunately, he misread my intent. Four hours later, we received a page from Gross at Netcom.

"You're not going to like this," Julia warned. When I had taken several attempts to transmit the "get ready" message, Gross had interpreted the flurry of signals to mean that Mitnick had already been arrested. For evidence, he had started to make backup copies of the files that Mitnick had stashed around the Internet, and then began deleting the intruder's own versions. I had wanted to make sure that my software and data was removed before it was stolen again. But prematurely tipping him off might alert him and allow him to escape.

There was also one piece of good news - Gross had analyzed Mitnick's deletion of The Well's login accounting file earlier in the day and had determined that it was the result of a simple typo, not an act of sabotage. But the bad news was devastating - our surveillance had now been irredeemably compromised.

And it had happened several hours ago. Gross had not called sooner, fearing my anger. This was unbelievable. Here I'd been riding the FBI as hard as I could, and now if everything fell apart and Mitnick escaped, they were going to be able to come to me and say, "Your guys blew it."

But there was no time to fret about the error now: my cellular monitoring gear indicated that Kevin Mitnick had just signed on for the night shift. And if he hadn't noticed before dinner that his stash es had been destroyed - and his presence now indicated he might not yet know - he was about to find out.

I wasn't the only one who'd heard Mitnick come back to life. Suddenly Burns's car and several other vehicles sped through the parking lot and disappeared behind a bowling alley at the end of the strip mall. It was a quick, final coordinat-

ing meeting of the federal and local law enforcement agencies, and Bowler drove the van around to join the half-dozen plainclothes men who had assembled. He handed Burns the amended warrants, and I warned the group that Mitnick might have been inadvertently tipped off, so haste was more crucial than ever. Someone mentioned that the Triggerfish agents now had a "beacon" to home in on and could now use a handheld signal-strength monitor for close-up work, so it shouldn't take long to find him. The meeting lasted less than a minute, and the others were off to take up their assigned positions around and on the far side of the Player's Club.

Something strange was happening, however. Although Kevin Mitnick was south of the cell site, I was now picking up a data carrier from the north. It was the first time I'd seen another cellular telephone data call being placed within this cell from anywhere but Mitnick's vicinity since I'd come to Raleigh. Because of the spotty reliability

and the mystery man's, confirming that we indeed had two separate data callers using the cell site. For 45 minutes, I continued watching the two.

Then, at almost precisely 1:30, Mitnick's carrier went dead. We immediately saw the Triggerfish station wagon zip past, first down Duraleigh Road, and then a short time later in the other direction. The car now had the directional antenna that had been on Fred Backhaus's van the previous night. The second data carrier was still on the air, and it was obvious that the Triggerfish agents had spotted it, too. Other vehicles were now moving in on the Player's Club as well. "Something's happened," Bowler said. "Let's go have a look."

He slowly pulled the van out of the parking lot and onto a side street nearer the apartment complex, stopping behind some bushes just to the east of it, where we could see directly into the parking lot. We stepped out of the van. We could now see that the area was well staked out. There

It was clear that Mitnick was beginning to understand what was in store for him: this game had real penalties.

of cellular connections, and the fairly high cost of the service if a person is not stealing it, it is not common to use cellular radio for transmitting data.

After I picked up the MIN - the cellular phone number - of this new data caller, I told Bowler, "Drive over to the phones." It was 12:40 a.m. He positioned the van as close to the pay phones as he could get it, with the vehicle between me and the apartment complex, and I slid out and called the Cellular One technician.

"Gary," I said, when Gary Whitman picked up his phone. "Are you watching?" He was indeed monitoring the Cellular One site, so I read him the new MIN and asked him to let me know each time our mysterious caller placed a new call and moved to a different frequency. He could do so by paging me with the new channel numbers.

Once again Bowler returned to our parking spot, and almost immediately I got the first of a series of pages, which allowed me to quickly flip between Mitnick's sector

were at least four government cars, and at least a dozen plainclothes men standing or walking around. The Triggerfish station wagon returned.

I wanted to go tell the agents what I knew about the new signals from the north, but Bowler came over. "No, no, no," he said, standing close to me. "There's nothing you can do at this point. Besides, we don't know if they have Mitnick yet. He might see you."

I handed Bowler my cell phone so we could wake Judge Dixon for authority to search Kevin Mitnick's home.

A little while later, Levord Burns came over to the van again to report progress. I asked if I could have a look at the apartment, to see how my opponent had spent his days and long nights, but he declined.

"We've taken lots of pictures of the inside of his apartment, but they're evidence for the trial, and no one else will see them until after it's over."

Despite the steady cold drizzle that was now soaking us all, Burns came around to

the side of the van and shook my hand.

"Congratulations," I said. "We managed to do this without killing each other."

He didn't reply, but for the first time since I'd met him, Special Agent Burns smiled at me.

I slept for a few hours, and then I was wakened by a call from John Markoff. "Kevin's court appearance is at 10 o'clock," he said. It was already a few minutes past nine. "We'll meet you in the lobby as soon as we can get dressed," I told him, gently shaking Julia awake, then pulling the hotel room curtains back on a gray, wet Raleigh morning.

Markoff drove us downtown through a light rain, and because I was feeling a bit out of touch since the crashing of my RadioMail terminal, I decided to use my cell phone to check my voicemail in San Diego. I couldn't believe it. The intruder had been sending me regular voice messages taunting me. Now there was a new message in that phony Asian accent, and it had been delivered just before 7 a.m. West Coast time, a full eight hours after Mitnick's arrest, but well before the media reported his capture.

The message was long and rambling with none of the cockiness or bravado we'd heard before but, instead, in a delivery so nervous and rapid that the accent occasionally fell away altogether. After listening to it, I played back the message twice more, first holding the phone to Julia's ear, then to Markoff's:

"Hi, it is I again, Tsutomu, my son. I just want to tell you - very important, very important. All these phone calls you received with, ah, making reference to kung fu movies - nothing to do with any computer thing whatsoever. Just a little, ah, interesting call."

"I see now that this is getting too big, way too big. I want to tell you, my son, that these have nothing to do with any computer activities whatsoever. Just making fun of kung fu movies. That's it. That's it."

"And making reference to, ah, you know, trying to make a reference to putting kung fu movies into the ... into a computer reference. That's it. Nothing to do with any Mitnick, hacking, anything, nothing. I tell you it was just an interesting call that's ... it. All coincidence. This is getting too big,

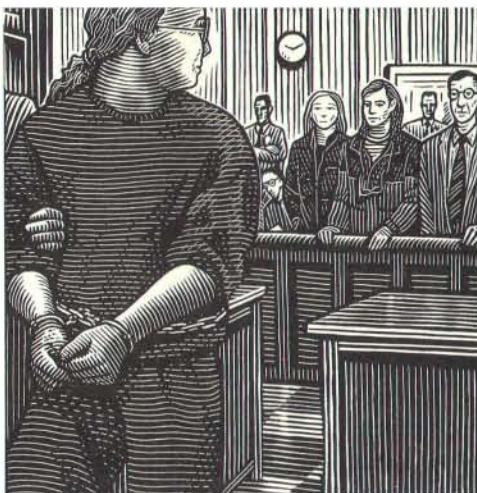
and nothing wrong has been done by anybody who left any messages on your voicemail. Just to let you know. OK? It's getting way too big."

We were amazed.

"So the tables have turned," I said.

I wondered aloud where Mitnick's friend had gone to ground. I was curious if he was hiding right here in Raleigh. Whom had Mitnick called in the minutes before he opened the door for the FBI the night before? Was this the owner of the second cellular phone who had been making the data calls that the Triggerfish team had been chasing?

We were still talking about this new



Handcuffed, his legs in chains,
Mitnick turned to face his captor.
"Tsutomu, I respect your skills," he said.

mystery as we entered the federal building. It was just a brief prearraignment hearing, and word hadn't yet got out that Kevin Mitnick had been arrested. We walked into a small empty courtroom and sat down in the last of the three short rows that had been reserved for spectators. It was like US courtrooms all over the country, an austere, windowless space with a high ceiling.

After a short time, Mitnick was led in from a door at the front of the room to the right of the judge's dais by a dour US marshal. Mitnick didn't look ill, but he also didn't look anything like the overweight, bespectacled "dark-side hacker" who had once terrorized Los Angeles. We saw a tall young man, neither thin nor stocky, who had metal-rim glasses and shoulder-length flowing brown hair. He was wearing a charcoal gray sweat suit, and he was

handcuffed and his legs were chained.

Halfway into the room, he recognized us and paused for a moment. He appeared stunned, and his eyes went wide.

"You're Tsutomu!" he said, with surprise in his voice, and then he looked at the reporter sitting next to me. "And you're Markoff." Both of us nodded.

As the judge read the charges - telecommunications fraud and computer fraud, each carrying a maximum potential sentence of 15 years or more - it was clear that Mitnick was beginning to understand what was in store for him. This game had real penalties. In a soft voice, he said he wanted the court's permission to contact his attorney in California. The judge noted that whatever happened in his legal entanglements, the US Court of the Eastern District of North Carolina would "have its way" with him first. The detention hearing was set for two days later on Friday morning.

The whole thing lasted less than 10 minutes. After the judge adjourned the court, Markoff made his way to the railing that separated the spectator gallery from the rest of the courtroom. Julia and I followed him. Mitnick rose and turned to face us.

He straightened and addressed me. "Tsutomu, I respect your skills," he said.

I returned his gaze and just nodded. There didn't seem to be much to say. In our contest he had clearly lost.

Strangely, I felt neither good nor bad about seeing him on his way to jail, just vaguely unsatisfied. It wasn't an elegant solution - not because I bought some people's claims that Mitnick was someone innocently exploring cyberspace, without even the white-collar criminal's profit motive, but because he seemed to be a special case in so many ways. This was the sixth time he'd been arrested. He certainly knew what the stakes were, and I hadn't seen any evidence of a higher moral purpose to his activities or even just innocent curiosity.

The marshal started to lead him away and Markoff said, "Kevin, I hope things go OK for you."

Mitnick appeared not to have heard him at first, but then he stopped for a second and turned back toward us. After giving a slight nod of his head, he turned away and was led out of the courtroom. ■ ■ ■

Smart Cars

◀ 130 else at Delco worried. And the company's relationship with leading defense contractor Hughes Aircraft, also a General Motors subsidiary and member of the highway consortium, may explain Delco's apparent jump on the competition.

"Technology is not an obstacle," says Tom Evernham, formerly Delco's senior VP of technology and marketing, now a vehicle line executive with GM. "That sounds like a brash statement," he states, with the unblinking gaze of a former fighter pilot, "but I'd almost be so bold as to say we and our associates can do virtually anything technologically. The problem is commercializing technology in an affordable way."

Indeed, the Hughes radar costs \$30 million per F-18. ("You pretty much buy the radar and the plane gets thrown in," says Owens.) But Delco's experience in mass production has helped the company adapt the system for use by clients whose pock-

Edith Page, policy coordinator for the highway consortium and manager of infrastructure and transportation for Bechtel, sees a parallel in another "expensive" technology. "It's analogous to air bags, which nobody wanted until suddenly people realized they could make a huge difference," she says. A reliable price estimate for smart-car hardware is difficult to make right now, but Page says sources at General Motors believe the cost of vehicle-based components can't exceed \$700 or \$800 per vehicle, which would subsume the price now paid for cruise control, antilock brakes, and other existing equipment that the automated-highway technology will utilize – albeit in a more advanced form.

Delco's Evernham sees this kind of integration as a key to smart-car success. Once the radar is in place, adding adaptive cruise control – which varies throttle and possibly braking to maintain following distance – is simply a matter of tying it into existing systems and writing some software. Pla-

fic, will it also keep tabs on drivers? Toll-debit systems now in use on several highways across the country have already become a source of anxiety among the privacy-conscious. As a car passes, the phantom tollbooth uses radio telemetry to register the vehicle owner's account number. If drivers blast through the gateless lanes without the appropriate electronic tag, their license plates are automatically photographed; computerized character recognition takes over, and the scofflaw gets a ticket or summons in the mail. If automated-highway users are required to log on to a central computer while traveling, far greater concerns will likely arise.

"It's the tracking aspect of it that makes me nervous," says Jack Keebler, Detroit editor of *Motor Trend*. "Who would have access to the information about where I've been? Advertisers would certainly like to know. Stores would like to know how close you come to their store each day, or where appropriate billboard advertising should go for people of the right demographic.

"I don't believe the systems by themselves are a bad idea – I think they have tremendous potential," he adds. "But they could be horribly misused. Every time you institute a control system like that, you've got to have some kind of checks and balances to say, 'OK, how much information do we want? How much information are we justified in taking? And how is it going to be used?'"

So far, checks and balances are enshrined only in the Fair Information and Privacy Principles (still in final draft form) assembled by the Intelligent Transportation Society of America, a federal advisory group. The gist seems to be that vehicles logging on to an automated highway system would be assigned an arbitrary, anonymous number expressly for tracking, while any personal information would remain private. Nevertheless, data collected by a government-run traffic infrastructure could fall under the Freedom of Information Act, which would mean that information about you may be available to anyone.

Fortunately, there's plenty of time to address these issues. The experts say we're still six years away from a prototype automated highway, much less the real thing. Evernham predicts that autonomous collision-warning systems with sensors,

"Technology is not an obstacle," says Delco's Evernham. "The problem is commercializing the technology in an affordable way."

ets aren't Pentagon-deep.

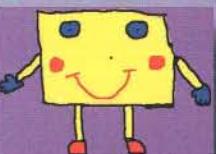
Delco has also ensured that Forewarn won't set off common radar detectors, a problem that plagued Greyhound Bus Lines's recently abandoned program. Starting in 1993, Greyhound fitted 1,700 buses in its fleet with radar-based collision-warning systems from Eaton Vorad. But the program was dropped in part because it would have been too expensive to upgrade the Vorad system to a frequency that wouldn't interfere with motorists' radar detectors.

One of the highway consortium's goals is to determine whether an intelligent transportation system will be worth the cost of constructing the necessary infrastructure. "We're going to have to show we can get enough yield out of the capacity, or save enough lives, that it would be worth what we're putting into it," says the Transportation Department's Johnson. "Finally, there's a market question: Will people find it valuable enough to buy the properly equipped vehicles to match the infrastructure?"

tooning is just another extension of this. Forewarn is a good example. The collision-warning prototype already varies following distance according to driving style. It's tied into various other onboard computers, so the warning distance automatically increases if the windshield wipers are on (indicating slick roads), the radio is being adjusted (a sign the driver isn't paying full attention), or the tire pressure is low (reducing braking capability). Constantly sharing information about the status of the vehicle improves the reliability of the onboard system.

The same could be said of traffic management systems. Siemens' Ali-Scout field test in Oakland County, Michigan, allows two-way communication between vehicles and infrared beacons at intersections. A central command system monitors how much ground the vehicles cover and, in the case of congestion, suggests alternate routes using in-car information displays.

But if the infrastructure can monitor traf-



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a la clase de computadora y
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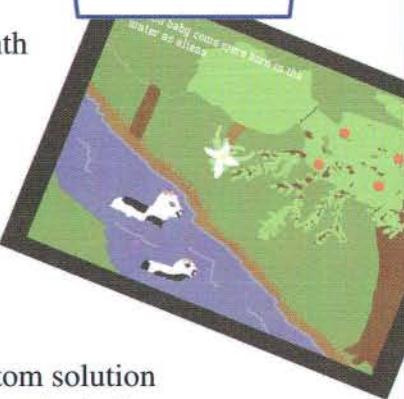
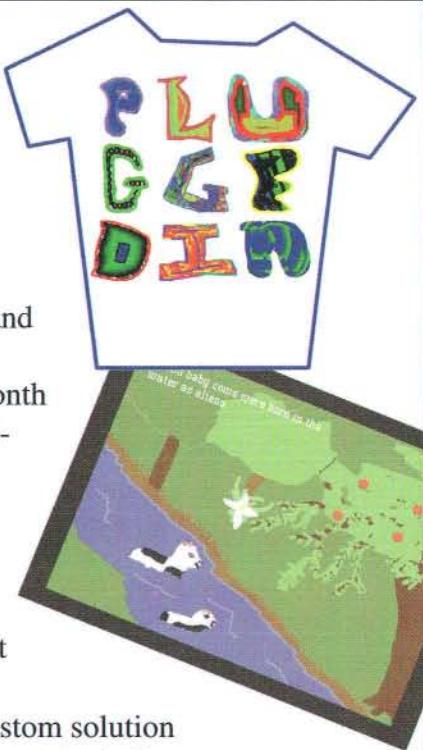


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Smart Cars

• 177 driver warnings, and perhaps limited braking authority will be available by the turn of the century. While the ability to automatically bring the car to a complete stop exists today, Delco will initially introduce the brake pulse or some other tactile warning so consumers can get comfortable with the new concept. Delco and its competitors are also aware of the profound liability issues involved in handing over control to a computer – and that, along with the automakers and dealers, they could find themselves in legal hellfire if collision-warning systems fail or are perceived to have failed. Everham says the simpler systems such as blind-spot detection are likely to come to passenger vehicles much sooner, thanks to interest among domestic and overseas automakers.

The National Automated Highway System Consortium still has to determine how much control consumers are willing to hand over

has to keep track of all these chess pieces on the board and help make decisions as to where they should move."

Brake now. I don't like the idea of becoming a motorized chess piece, and I bet Golden Oldie wouldn't either. I may have enjoyed thinking of my old car as a living thing, but she knew her place. I was always in control. And for many people, that's what driving is about. The open road has a draw of its own – few drivers want to sit behind the wheel of an overgrown slot car. Increased "throughput" and decreased accident rates are admirable goals, but there's something romantic about a haphazard formation of chromed rattletraps thundering down the boulevard, kissing fenders and slicing through yellow traffic signals. I hope the future will still have room for that.

But it makes the experts nervous. "If you share the road with dumb cars, you can't get all the benefits of safety and capacity

"The tracking aspect makes me nervous," says Keebler. "Smart-car systems have potential, but they could be horribly misused."

– and to whom. Because of the split-second response time needed to keep a moving vehicle out of harm's way, lane-following and collision avoidance will probably happen entirely onboard, using processing power estimated to be equivalent to that of a common PC. The roadway infrastructure will have a more macro role. "There will be vehicle-to-vehicle communication and/or vehicle-to-roadway communication for controlling the positioning and speed of the vehicles," says Rillings. "We believe more general control and decision-making will be handled by the roadway infrastructure. For example, what speed should the vehicle streams run at? Should there be platoons? What should the platoons look like? Should the platoons be large or small? How do you accommodate vehicles entering the automated section? How do you tag them onto platoons? How do you get cars off at the right exit? These kinds of higher-level decisions will probably be made by the infrastructure. Something

increase," says Rillings. "And it becomes much more complicated technically if you have random, manually controlled vehicles intruding. On the other hand, early in the process of adding automated lanes, it probably won't be socially palatable to have one or two lanes out there with only four cars on it every 10 miles. It may be that early in the transition to automation, automated cars will run with reduced benefits to prime the pump."

Today, priming the pump means that moneyed folks who drive cars with antilock brakes can be rear-ended by poor souls driving cars without. You still can't buy a higher station on Natural Selection Street. But the future may hold another battle between the technological haves and have-nots, in which the haves zip along in their computer-guided smart cars like automated road warriors in Armani suits, while the have-nots take their chances on the brave new road in clunky old beaters – unsafe, unclean, but totally free. ■ ■ ■

Bad Law

◀ 135 and perhaps stop a law that, in their eyes, was unconstitutional. Some of these people's worst fears about the capital's corrupting influence seemed to be confirmed. They'd wrung their hands when, in 1992, the EFF moved from Cambridge, Massachusetts, to Washington, DC, arguing it was a bad sign that the group chose to abandon the creative semi-counterculture of Harvard Square for the power-obsessed, backstabbing élite of Capitol Hill. And now this: the EFF's virtual stamp of approval on an ill-conceived, dangerous new law.

To hear EFF co-founder John Perry Barlow tell it, the drama reached nail-biting proportions when, at the eleventh hour, the EFF got a golden opportunity to stop passage of the Digital Telephony Bill. Senator Malcolm Wallop (R-Wyoming), citing "general concerns," placed a hold on the bill before it could be voted on. It just so happens Wallop is a friend of Barlow.

"Malcolm put a hold on the bill mostly for political reasons," says Barlow, who is also vice chair of the EFF board (*Wired* President Jane Metcalfe was, at the time, a member of the EFF board). "He used it as trading stock with Democrats in order to stop a California wilderness bill he opposed. He's also a civil-libertarian type of Republican, and Digital Telephony made him uneasy. I'm very close to him and to his former chief of staff; I'm reasonably certain that if I'd called him on the basis of that and said, 'Keep the hold,' they would have. And the bill would not have passed." (Others in the privacy community accuse Barlow of delusions of grandeur. "No way could he have stopped it," says one source who requested anonymity. "He just says that to show everyone how long his dick is." Wallop, now retired from politics, did not respond to phone calls or a fax. Other politicians, when asked to comment on their vote for DigiTel, were equally silent.)

In any case, Barlow never made the request. Instead, he dialed into The Well and tried to explain why. "From some of the reactions, you'd think I was the Darth Vader of civil liberties," he recalls. "People don't read all that carefully. If you shoot a whole bunch of ASCII at them, with com-

plex legal stuff in it, many are not going to get it. Some of my most vocal opponents never grasped the huge difference between the initial bill and the one that passed."

All things considered, does Barlow still think the EFF fought the good fight? "Hell, I think we won," he says without hesitation, brushing aside notions of a Pyrrhic victory. "Politics is simply the art of the possible. If you're a purist, you go down to defeat almost every time, and the things you care about ultimately suffer. Maybe your honor and dignity will remain intact, but the environment or civil liberties or whatever your cause is won't. Sometimes you have to do a bit of nasty dealing. We got right down to the floor of the sausage factory, getting ourselves smeared with blood and pig fat, and it wasn't all that pleasant. But we did what we felt we had to do, and I'm proud of that."

That the EFF never actually supported – in fact, opposed – the bill was largely lost in the fracas. The critics who did acknowl-

new wiretap bill could not be fought off much longer.

- The group had become worried that the FBI was already claiming new wiretapping powers without proper regulation or oversight. "The FBI kept going to the phone companies asking for incremental changes and improvements," says Barlow. "And getting them without any legal overview at all." The EFF propounded that a new wiretap law with some checks and balances would put an end to such "under-the-table deals."

- Representative Edwards, the privacy groups' chief ally on the House side was about to retire.

- The EFF looked to the future and for once didn't like what it saw: the political climate was about to become much more conservative after the elections of November 1994. If the 103rd Congress didn't deal with the wiretap issue, and the 104th turned out to have a Republican majority in the House and the Senate (which it

"We got down to the floor of the sausage factory," says Barlow, "smeared with blood and pig fat, and it wasn't all that pleasant."

edge that fact still saw it as further evidence that the EFF had lost its way. They asked good questions: How can you co-engineer a law that you believe is wrong and misguided? Didn't the EFF understand that by helping shape the Digital Telephony Bill, the organization also helped legitimize it? And that this made it easier for lawmakers to vote yea because, after all, prominent privacy advocates had been involved in drafting the statute?

In these dissenters' eyes, the merry pranksters of the digital age were in cahoots with robocops and superspooks.

Why the EFF did it

What the EFF has to say for itself boils down to four points:

- FBI Director Louis Freeh was starting to convince lawmakers that he needed updated wiretapping authorities. In the light of the World Trade Center bombing and Congress's overall toughness on crime, it seemed clear to the EFF that a

did), law-enforcement interests would likely obliterate privacy concerns. It became important to whip up a wiretap bill and get it to the floor before the Republicans took over.

"Look at the present Congress and tell me with a straight face that a new, far worse version of the wiretap bill would not pass now if we'd held off last year," argues Stanton McCandlish. "If you're still skeptical, why not examine last year's *Congressional Record*; you'll find no less than 30 bills that pose serious privacy and free-speech threats."

Down and dirty

In an EFF profile ("The Merry Pranksters Go to Washington," *Wired* 2.06, page 77) written months before the wiretap bill fiasco, co-founder Mitch Kapor said that the move from Cambridge to DC represented a "struggle" and a "clash of two cultures" within his ranks, not just within the constituency. But, concluded Kapor, it 182 ►

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◀ 181 was worth the imbroglio, because the change of cultural climate turned out to be "incredibly stimulating ... watching how power works. Trying to reverse-engineer the architecture of the Beltway."

As it turned out, the Beltway reverse-engineered the EFF. For starters, policy director and former executive director Jerry Berman, a dealmaker par excellence whom some outside the organization fingered as the chief culprit (both in the EFF's alleged moral corruption and the passage of the bill), left to form a new cyberspace rights group, the Center for Democracy and Technology. Officially, that move wasn't the result of the row over the Digital Telephony Bill. Berman was widely seen as a cunning negotiator, someone who forced coalitions and was prepared to get down and dirty if he thought it would advance the Greater Cause. Supposedly, his limited experience with num-

AT&T, Microsoft, Bell Atlantic, and others. The number of full-time EFF employees was eventually cut in half, from a high of 11 paid staffers to five plus one volunteer.

The granularity principle

Officially, the EFF won't say what happened at that fateful board meeting in July 1994, when it was decided not to oppose the Leahy/Edwards DigiTel legislation on principle but to work to improve it. Participants who speak off the record concede that sparks flew. "The only thing we all agreed on was that the original bill stunk to high heaven," says one source. "How to handle it from there was a highly contentious matter."

Former board member Denise Caruso describes the meeting as "monumental, dramatic. I was sick to my stomach." She declines to reveal the vote, but says that she abstained. "I couldn't support [helping draft a new wiretap bill], and I couldn't *not* support it. It was an impossible situa-

they would have gone batshit." So why didn't the EFF know earlier how serious the situation was getting? "Because distributed organizations suck," Caruso intones. "Everyone's somewhere else."

There was, however, another reason why the EFF ultimately didn't Take It to the People. David Johnson, another board member, remembers taking part, a mere few weeks later, in negotiations inside a hearing room on the Hill. He along with EFF lobbyists Berman and Daniel Weitzner were seated at one side of the table, five or six of the politicians' staff members on the other. The talk turned to transactional records - the data showing which online areas a computer user frequents, and which phone numbers he or she calls. The former category, argued the EFF delegation, deserves extra protection from government snoops, because it says much more about the person's interests, opinions, and affiliations than does a list of phone numbers called by that same individual.

"I'd brought a glass jar filled with sand and a couple of stones," Johnson recalls. "The stones, I explained, were phone calls. The grains of sand were the online transactional records. I referred to it as 'the granularity principle.' I said, 'Look, if law enforcement can isolate and examine every grain of sand, not just the stones, it's obviously a grave threat to a person's privacy.'"

The Congressional aides appeared to be swayed by the argument. They asked the EFF people to leave the room to facilitate "private deliberation." When the delegation was invited back, the EFF received a final offer. The Digital Telephony Bill would indeed offer increased protection for transactional records (to obtain them, a court order would now be required, not a mere subpoena) if the EFF agreed not to oppose the bill further. The condition was agreed to. While ACLU lobbyists were still working Washington's corridors of power to try to kill the bill, the EFF not only did a deal with the other side; it allowed its silence to be bought.

Fat-cat lobbying machine

After Berman's Center for Democracy and Technology splintered off from the EFF, it was getting hard for the EFF to pay the bills, says Barlow. "Most of our funding went over to CDT. We found that we had

"The only thing we all agreed on was that the original bill stunk to high heaven."

ber crunching and administrative trivia was one reason the EFF asked him to leave. The organization's newfound mission as a legal and educational force, not as a policy group, was another reason. All that just happened to occur in the aftermath of the group's greatest crisis.

Though the departure seemed amicable on the surface, a lovefest it wasn't. One source close to the process, who wants to remain anonymous, says that Berman "got so wrapped up in the game that he lost sight of the goal. Jerry's a loose cannon: he would go off and say things that he hadn't consensus on. On the other hand, it's really hard to get consensus within the EFF board. Especially with Digital Telephony, there was an incredible amount of soul-searching. It was the most divisive issue the EFF ever confronted."

Berman, for his part, says he never negotiated anything without a solid mandate from his colleagues. "I have all the papers and electronic records to back that up."

What's uncontested is that he took many of the EFF's corporate sponsors with him:

Politics is largely a binary world. In a binary world, there is no/yes. But in the world where people live, there are many more permutations - like 'No, unless you do X' or 'Yes, but only if you remove Y.'

Another source says that Caruso was one of three abstainers; six people on the board voted for collaboration; only one - John Gilmore - voted against it. Gilmore won't confirm this, but in an e-mailed reply to an interview request, he seemed bitter about the whole affair and the climate in Washington. "Civil rights and the power to tax are like canaries," Gilmore believes. "Nobody is always watching the canary. Congress is a roomful of cats, and all the canaries get eaten eventually."

Because of time constraints, some board members felt they had no choice but to work with the FBI and the policy makers on Capitol Hill. "If we had known two or three months earlier how rapidly the legislation was advancing, we could have done something about it," says Caruso ruefully. "We could have had a campaign, we could have taken it to the people and

been overdependent on corporate money. The EFF had been developing into an expensive organization, a big fat-cat Washington-style lobbying machine. That's not inherently wrong, but you run into trouble when you take a position different from that of your corporate masters. For example, we were perhaps too timid when it came to discussing our views on intellectual property, because we didn't want to piss off Microsoft. So I felt, even before the Digital Telephony nightmare, that we needed to wean ourselves from that corporate nipple in order to maintain our conscience." He pauses, then adds with a wry smile: "Of course, I didn't want to see the weaning happen quite so suddenly."

Last July came EFF's decision to leave Washington for San Francisco, where most of its "funding base" is located. The official line, as explained by Stanton McCandlish, is that Berman's Center for Democracy and Technology negates the need for the EFF in Washington; that both groups can now "complement" each other. Berman says he's perfectly willing to maintain his working relationship with the EFF; that, indeed, they're "good friends." But he's a little puzzled by his good friends' one-way cross-country trip. "To change the system, you have to be in Washington," he reasons. "You don't sit in Silicon Valley and expect Washington to come to you."

The EFF's interpretation – in the end it was all for the best, everything is hunky-dory now – is, perhaps, a little skewed. To the casual observer, it looks like Washington tarred and feathered the EFF, drove it right out of town, laughing, with this message: We play this game better than you.

Whatever the correct take, the EFF is flat broke. Worse than that: board member John Gilmore confirmed, the group is in debt to the tune of US\$200,000.

And no amount of spin – all right, let's call it positivism – can undo the language that flashed across newsgroups in those final months of 1994. There were snubs and slights from the organization's constituency, and angry charges poisoning bulletin boards. Charges of collaboration, sellout, and betrayal.

"Weird and disconcerting"

We're back in that ballroom with the earnest telephone company folks, and the

talk has turned to war. World War II, to be precise. Maybe it's that there's another 50-year commemoration today that is splashed all over TV screens and front pages. It happens to be a convenient metaphor for those to whom rhetoric comes naturally.

First meet Don Haines, a lawyer for the American Civil Liberties Union, which continues to oppose the wiretap bill all the way. Haines, a teddybearish man who looks agreeable enough, is probably the only one here who is not only concerned about the issues discussed; truth be told, he's just plain mad. I find this out when I introduce myself during a coffee break. Before his cup even hits the saucer, he's muttering angrily about the disgrace being concocted here, at the telephone industry's wiretap workshop, where everyone is scrambling to find out how to implement the technical changes the Digital Telephony Bill requires. Haines is reminded of the war because, he says,

tively short time is amazing," intones the lawyer for the FBI's Information Division in an improvised speech. "This was after we had part of our fleet destroyed, at a time when there was little domestic harmony. Back then, we coped beautifully with what seemed like insurmountable problems, and we came out on top. I think the lesson should be this: If we all work together and give our utmost, we can do it, and we can do it quickly."

He is, of course, not referring to any bold battlefield action he expects of his audience; McDonald is just telling the phone companies again, in an admonition disguised as faint praise and fiery pep talk, that now is the time to start redesigning their software and hardware. You'll be rewarded for your efforts with a nice fat carrot of half a billion dollars, he's saying. Now get to work and make it snappy.

I have a question for Dan Haines, and I'm not sure if it's me talking, or the devil's advocate I love to impersonate. Listen,

"To change the system, you don't sit in Silicon Valley and expect Washington to come to you."

"These proceedings are like discussing whether the Japanese internment camps should have inside or outside plumbing – when what we should be talking about is the desirability of those camps to begin with. I find this incredibly weird. Weird and disconcerting. Why doesn't anyone stand up and say, 'Can't we undo this?'"

What does he expect, I inquire. After all, isn't the wiretap bill a *fait accompli*?

"That's what they all think, isn't it?" he says. "Well, the money for the bill, \$500 million, has been authorized, but not appropriated yet. That is a whole different political process. As far as I know, everyone – the ACLU, EPIC, EFF, CDT – is going to oppose appropriation. I believe we have a fair shot at stopping it; remember, Congress is in a budget-cutting mood. Maybe I can draw some attention to those facts here. Other than that," he adds, cracking a smile, "just consider my presence a bit of nonelectronic surveillance."

On the stage, Alan McDonald, too, talks of the war. Uses it as a rallying cry. "What American forces accomplished in a rela-

I tell the ACLU man: the first version of the new wiretap bill was horrendous, no doubt about it. Then the EFF and Leahy and Edwards made it a lot less so. That's a real result, which, maybe, beats churning out high-minded Op-Ed articles bemoaning any form of effective compromise.

Haines sighs. "But you've got to understand how radical this law is. What we're talking about is the federal government requiring an industry to change its product so that the government can spy on the industry's customers more readily. There is no fundamental difference between that demand and the government mandating there should be a tiny camera built into the corner of every computer screen which they can activate whenever, with the right papers. The FBI has said all along that it's not seeking new wiretapping powers, just maintaining current ones. This is a fallacy, and here's why. Up to now, it had the ability to wiretap, because that's how the world developed. No one said a century ago, 'We want to make sure our government police 184 ▶

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◀ 183 force has the ability to eavesdrop on our conversations, so we should design our communication lines so they can do that.' Reversing that precedent is just so totalitarian - it's incredibly, profoundly unconstitutional.'

The other beef Haines has is that obtaining a court order to wiretap may

questionable anyway, argues Haines's colleague Barry Steinhardt, associate director of the national ACLU at the organization's headquarters in New York City. "There are about 1,000 wiretaps each year," he says. "Only a small percentage of them result in convictions. Secondly, in order for a law-enforcement agency to obtain a wiretap, it has to have some evidence a crime is being committed. So why do they even

violate your privacy because we're looking for a bookie or a prostitute?' The first approach would probably generate considerable support - certainly after Oklahoma City - but I'm sure the more truthful second approach would not."

"This is like discussing whether internment camps should have inside or outside plumbing."

sound impressive, but it's probably a paper tiger. He doesn't know of one single case of a federal judge turning down an FBI wiretap request in the last six years. "That can mean two things," Haines muses: "Either the judge is always impressed with the officers' impeccable homework and can never find any reason to deny the request, or law enforcement successfully seeks out those judges most likely to sign."

And the effectiveness of the wiretaps is

need the wiretap evidence? And thirdly, wiretaps have been applied primarily in cases of 'lifestyle' crimes: drugs, gambling, and prostitution. Now, those are felonies that perhaps shouldn't be considered crimes at all. But even if you want to go after those kinds of lawbreakers, there's a big difference between saying to the American people, 'We need to be able to wiretap so we can catch terrorists and serial bombers,' and, 'We want the potential to

A copy for a datacop

The morning of my interview with Jim Kallstrom, an FBI assistant director, a friend sends me an article from the *San Jose Mercury News*. It reads, in part:

"As the US Senate debates granting the Federal Bureau of Investigation new powers to wiretap personal communications, three West Coast computer programmers have planned their own preemptive strike: a free program, distributed on the Internet, that renders legal and illegal wiretaps useless. The programmers, Bill Dorsey of Los Altos, California, Pat Mullarkey of Bellevue, Washington, and Paul Rubin of Milpitas, California, plan to release today a program that turns ordinary IBM-compatible personal computers into an untappable secure telephone. It uses an encryption algorithm called

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'triple-DES' that is widely believed to be unbreakable."

When I mention the piece to Kallstrom, whose most distinguishing feature is oversized earlobes - oddly appropriate for a wiretap buff - he asks to make a photocopy. We both smile, appreciating the humor of the situation: I've barely been in this datacop's office for 10 minutes, and I'm already being asked to turn over my information. It's a nice little icebreaker, and now seems like a good time to bring up Digital Telephony's twin brother: encryption. One is almost useless without the other. After all, what good is the ability to wiretap phone and data lines if the signal you intercept is electronically garbled? Unless, of course, you also have codes that let you ungarble anything that anybody zaps over that wire.

The Clinton administration's 1993 Clipper Chip proposal (see coverage in *Wired* 2.04, 2.06, 2.09, and 3.11) met with so much resistance that the plan was eventually dropped - hastened by the fact that a scientist at AT&T Bell Labs had found a flaw in the prototype of the Clipper's supposedly ultrasafe design. But the issue is not about to go away. Freeh was walking the fine line between concern and cynicism last April when he urged lawmakers to understand that "the FBI cannot and should not tolerate any individuals or groups that would kill innocent Americans, that would kill America's kids." Congress, said Freeh, should think about what it means that "encryption capabilities are available to criminals and terrorists."

I ask Kallstrom what he thought when privacy groups and other adversaries torpedoed Clipper in 1994. He shrugs. "We knew right from the beginning that the Clipper Chip wasn't going to be universally adopted and by all computer makers. It was only the first attempt to show that this kind of thing could work."

Kallstrom doesn't know whether or not government-controlled encryption is unavoidable. "It's a function of how much cooperation we get from the main players in technology - the Microsofts and the Lotuses and so on. I can tell you right now there are a lot of people in private industry, people in Fortune 500 companies, who want key escrow, because they don't want some disgruntled employee selling all of

their trade secrets down the tubes."

Is Kallstrom implying that Microsoft and IBM are pining for an encryption scheme to which government officials hold the key? It seems like a specious argument. Why wouldn't big businesses be capable of using their own watertight, carefully guarded encryption, and prefer that the keys remain entirely within the company? Kallstrom will only say that "without some public policy, we're going to get less information. I'll give you that. The debate is ongoing in Congress, in this administration, and in the business community. How that will fall out, I don't know."

How does the assistant director feel about reports by the Bureau of Justice Statistics that say roughly three out of four Americans are against wiretapping, a figure that has remained steady for the last 20 years? "I don't believe those polls. You can construct a poll to get any answer you want," says Kallstrom. True - but, uh, this was a survey published by his employer,

But, I say, the same point was made by the Electronic Privacy Information Center in Washington, DC. The center maintains that implementing Digital Telephony is like "cutting a door into a wall where no previous opening existed." No dice.

"Nonsense," says Kallstrom. "Look, that assumes we're hacking our way in, that we've built some vulnerability into the technology so that we can come in through the back door. In fact, the way this bill is written you can't get in there, without someone inside, someone in a small group of phone company security people who have access to the software. We don't do this remotely. We don't sit at a computer and access the central office switch. We bring a court order to the phone company, and only the people who work there and have been designated to enable the [wiretaps] can route the content out to us over our lease line. Again, we're not hacking our way into the network."

Among the captivating reading on the

"Unless you're a criminal, you have nothing to fear from the government," said Kallstrom. That was obviously a belief he held dear.

the Department of Justice. "No it wasn't," Kallstrom barks. "You're quoting some *USA Today* or EFF poll or something. It's just total nonsense. Somebody is interpreting numbers for their own political purposes." (Here's the origin of my data: *Sourcebook of Criminal Justice Statistics*, US Department of Justice, 1992. The question pollers asked: "Everything considered, would you say that you approve or disapprove of wiretapping?")

Was Kallstrom surprised by the assertion of the General Services Administration - the largest nonmilitary purchaser of telecommunications equipment in the federal government - that the FBI wiretap plan would in fact make it easier for hackers and criminals to penetrate the phone network and snoop around? It's another one of his not-so-favorite subjects. "They don't know what they're talking about," he sneers. "It's stupidity. You can quote me. It's just stupidity. Whoever said that is not aware of the facts."

way back to my hotel is New York's *Daily News*: "The FBI has kept tabs on a Brooklyn-based Haitian newspaper, immigrant support groups, and even a student exchange program...." The information comes on the heels of *The News*'s revelation that the FBI was secretly spying on ACT UP and other AIDS advocacy groups.

Hmm. Kallstrom had just told me that he did not understand what the opposition to Digital Telephony and Clipper was about. "Unless you're a criminal, you have nothing to fear from the government," he'd said. That was obviously a belief he held dear. Still - I wondered if student exchange programs and gay rights groups really foster the "criminals and terrorists which would kill innocent Americans, kill America's kids." (Kallstrom claims that the ACT UP file is of an "administrative," not an "investigative" nature, and that the FBI has neither infiltrated the group nor wiretapped its phones. "Maybe we shouldn't call it a file at all," he says, exasper-

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◀ 185 ated, pondering the somewhat intimidating connotation of the word. "Maybe we should call it a banana.")

Media dud

Perhaps the *Exon Decency Act*, the first all-out attempt to censor online communications, roused passions all around not just because of its boldness. It may also have struck a nerve because it had the advantage of clarity. The gist can be given in a few sentences. That perhaps explains why newspapers and TV stations across the country covered it fairly extensively. The Digital Telephony Bill, by comparison, was a total media dud. Relatively few people heard about the new wiretap law because reporters and editors, by and large, found the bill and its implications too unwieldy to explain in a few paragraphs.

Andre Bacard, author of *The Computer Privacy Handbook* (Peachpit Press, 1995), believes that the story of the Digital Telephony Bill "should be on the front of every newspaper, because here is a law that attacks the core of our democracy."

Bacard got his wish, if belatedly. Last November, almost 13 months after the passage of the Digital Telephony Bill, the news media caught on to the fact that something strange and odious had happened. "FBI Wants Advanced System to Vastly Increase Wiretapping," read *The New York Times'* front page. It reported that a proposed new national wiretapping system "of unprecedented size and scope" would give government the capacity "to monitor simultaneously as many as one out of every 100 phone lines in some high-crime areas in the country." (The estimate was later scaled back to one in 1,000.) Apparently, the FBI was ready to utilize the powers it had been given under the wiretap bill – and then some.

Keeping tabs on taps

Those who find the Digital Telephony dis-

pute a bit too high-minded – an argument over whose principles are superior – might want to focus instead on a more mundane component of the issue: money. According to the bill, phone companies will receive up to half a billion dollars over a four-year period to pay for the required changes (appropriation still pending).

"That's an enormous price tag for the potential return of being able to prosecute a few dozen extra cases each year," says Blaise Liffick, the mid-Atlantic director of Computer Professionals for Social Responsibility, a group that opposes funding for

It's not too late to toss a wrench into the Digital Telephony Bill. Though the bill has passed Congress, the dollars to fund it have not yet been appropriated. A public comment period was due to end January 16, but there's still time to influence the appropriators. Write, call, or e-mail your Congressional representative. You can also contact:

THE ELECTRONIC PRIVACY INFORMATION CENTER Located in Washington, DC. EPIC is at the forefront of the fight against the bill. Its Web site contains detailed instructions on ways to fight DigiTel. Steer your browsers to http://www.epic.org/privacy/wiretap/oppose_wiretap.html.

REPRESENTATIVE BOB BARR The Georgia Republican is a former federal prosecutor and the leading Congressional opponent of the FBI's request for wiretap funding:

Representative Bob Barr
US House of Representatives
1607 Longworth Building
Washington, DC 20515
+1 (202) 225 2931

THE FBI Does it surprise you that comments must be submitted in triplicate? Address them to:

Telecommunications Industry Liaison Unit
Federal Bureau of Investigation
PO Box 220450, Chantilly, VA 22022-0450

VOTERS TELECOMMUNICATIONS WATCH Check out the Digital Activists' Toolbox at <http://www.panix.com/utw/citguide/citguide.html>. E-mail vtw@vtw.org.

THE AMERICAN CIVIL LIBERTIES UNION For excellent background on wiretap law, gopher://aclu.org:6601/.

HOTWIRED Check out the privacy archive for more dope on DigiTel and other Congressional shenanigans at <http://www.hotwired.com/Lib/Privacy/>.

Digital Telephony. "Especially when you consider that even law enforcement agencies admit that the efficacy of wiretapping is quite low, and that often the information gleaned could have been obtained in some other, more standard, investigative way."

Already, wiretaps are expensive. Numbers released by the Administrative Office of the United States Courts show that the average tap costs \$49,478. For federal wiretaps, the price tag is \$66,783.

But it gets worse: the proposed half-a-billion sum may not be enough. Since

communications technology is constantly changing, and the implementation standards for DigiTel remain under discussion, experts say the eventual cost could run into the billions.

"Law enforcement thinks that the problem won't exist in five years, that the networks will be properly modified," says Roy Neel, president of the United States Telephone Association. "Well, the phone companies will introduce technologies in the future that don't even exist today. Those need to be made wiretap-friendly also, and who's going to pay for that? Are we going to charge our customers for the privilege of having their phones tapped?"

The other thing that concerns Neel is that the Digital Telephony Bill may hamper technological development. No phone company is going to invest in new gear without having it greenlighted by the government.

The vague funding mechanism makes it difficult to understand why Congress voted for a law whose financial consequences it could not possibly predict. "I don't know either," concedes Neel. "But I can tell you it's done every day."

Jerry Berman is equally glum. "The Digital Telephony Bill passed on the final day of the 1994 Congress. The number of bills that got to the floor was staggering. You and I now know a lot more about DigiTel than just about anybody who voted on it in Congress. There's not much rationality to the process."

Could the Digital Telephony Bill have been prevented? It's now a moot question. Says EFF board member John Gilmore: "Bad bills exist. Members of Congress will introduce them. Administrations will push them. They will get enacted no matter how stupid they are or no matter how much they hurt society." Gilmore believes that, given the deep divisions in society about what is good law and bad law, "the best we can do is to make it harder for government to do anything." Then, he says, "it can at most be inept – even if it's completely malevolent." ■ ■ ■

Colophon

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Text: 45# Intrepid Low Glare.

Songs that helped get this magazine out:

"Friendly Pressure," Jhelisa; "I Want to Be Evil," Eartha Kitt; "Janine," Soul Coughing; "La Grippe," Squirrel Nut Zippers; "Love Is the Icon," Barry White; "Love Letters," Ketyl Lester; "Pass the Dust," The Androgonauts; "Right Beside You," Sophie B. Hawkins; "Soda Pop," G. Love and Special Sauce; "Trouble Me," Dag Nasty; "Water," PJ Harvey; "Wonderwall," Oasis.

Drinks of choice: Benadryl and Dramamine cocktail with Prozac chaser, Bombay Sapphire gin gimlet, Bud Light, Chartreuse, DeKuyper's Koolmint schnapps, Diet Coke, Dragon Well tea, Goldschläger, Ketel One martini, Pyramid Apricot Ale, Robitussin DM.

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Message 32:
Date: 2.1.96
From: <nicholas@media.mit.edu>
To: <lr@wired.com>
Subject:

What weighs less than one millionth of an ounce, consumes less than a millionth of a cubic inch, holds 4 million bits, and costs less than US\$2? What weighs more than 1 pound, is larger than 50 cubic inches, contains less than 4 million bits, and costs more than \$20? The same thing: *Being Digital* stored on an integrated circuit and *Being Digital* published as a hardcover book.

The most common question I get is, Why, Mr. Digital Fancypants, did you write a book? Books are the province of romantics and humanists, not heartless nerds. The existence of books is solace to those who think the world is turning into a digital dump. The act of writing a book is evidence, you see, that all is not lost for those who read Shakespeare, go to church, play baseball, enjoy ballet, or like a good long walk in the

What mass medium is larger than the American TV and motion picture industries, has no advertising, and is truly a medium of choice?

woods. Anyway, who wants to read Michael Crichton's next book, let alone the Bible, on screen? No one. In fact, the consumption of coated and sheet paper in the United States has gone from 142 pounds per capita in 1980 to 214 pounds in 1993.

It's not a book – it's bits

The word is not going anywhere. In fact, it is and has been one of the most powerful forces to shape humankind, for both good and bad. St. Thomas said a few words in southern India almost 2,000 years ago, and today the southern province of Kerala is 25 percent Christian in a country where Christians are less than 1 percent of the population. There is no question that words are powerful, that they always have been and always will be. This back-page column, except for my loathsome picture, has never had anything in it but words.

But just as we seldom carve words in rocks these days, we will probably not print many of them on paper for binding tomorrow. In fact, the cost of paper (which has risen 50 percent in the past year), the amount of human energy required to move it, and the volume of space needed to store

The Future of the Book

it make books as we know them less than the optimum method for delivering bits. In fact, the art of bookmaking is not only less than perfect but will probably be as relevant in 2020 as blacksmithing is today.

It's not bits – it's a book

And yet books win big as an interface medium, a comfortable place where bits and people meet. They look and feel great, they are usually lightweight (lighter than most laptops), relatively low-cost, easy to use, handsomely random-access, and widely available to everyone. Why did I write a book? Because that is the display medium my audience has today. And it is not a bad one.

We can "thumb" through books, annotate and dogear their pages – even sit or stand on them when we need to be a mite taller.



I once stepped on my laptop, and the result was awful.

The book was invented 500 years ago by Aldo Manuzio in Venice, Italy. The so-called octavo format was a departure from previous manuscripts because it was handy, portable, and pocket-size. Manuzio even pioneered page numbering. Odd how Gutenberg gets credit while Manuzio is known to only a few. Today's Manuzios are the flock of researchers looking for display materials capable of producing handy, portable, and pocket-size flat-panel displays for PDAs (personal digital assistants, a term coined by John Sculley five years ago and one of the weirdest acronyms to stick). In general, these efforts miss the point of "bookness," because the act of flipping through pages is an indisputable part of the book experience. In 1978 at MIT, we animated flipping pages on a screen and even generated fluttering sounds. Cute, but no cigar.

A new effort by Joe Jacobson at the Media Lab involves electronic paper, a high-contrast, low-cost, read/write/erase medium. By binding these pulplike, electronic leaves, lo and behold – you have an electronic book. These are quite literally pages onto which

you can download words, in any type, in any size. For the 15 million Americans who want large-print books, this will be a gift from heaven – if Joe succeeds during the next couple of years. So, those of you who don't want to climb into bed with "Intel inside," there is hope. This is the likely future of books.

The model said never to work

When my colleagues and I argue that the mass media of the future will be one that you "pull from" versus one that is "pushed at you," we are told: Poppycock! (Or worse.) These naysayers argue that a "pulling" model cannot be supported because it eclipses advertising. While I am not sure it is even true, let's pretend that it is and ask ourselves: What mass medium today is larger than the American TV and motion picture industries combined, has no advertising, and is truly, as George Gilder puts it, a medium of choice?

The answer: Books.

More than 50,000 titles are published in the United States each year. Guess the typical number of copies published per title. A major house considers 5,000 to be about the lowest run it can support economically, while some of the small houses consider 2,000 copies of a title a large run. Yes, more than 12 million copies of John Grisham's novel *The Firm* were printed, and the first run of Bill Gates's book was 800,000. But the average is much smaller, and these less massive books are not unimportant. They just interest or reach fewer people.

So, the next time you ask yourself about the Web (which is doubling in size every 50 days) and wonder what will economically support so many sites (today, one homepage is added every 4 seconds), just think books. You say to yourself, Surely most of those Web sites will go away – no way. There will be more and more and, like trade books, there will be an audience for all of them. Instead of worrying about the future of the book as a pulp standard, think about it as bits for all: bestseller bits, fewer specialty-seller bits, and no-seller bits for grandparents from grandchild.

Meanwhile, some of us in research are working really hard to make them feel good and be readable – something you can happily curl up with or take to the john. ■ ■ ■

Next Issue: Language on the Net



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